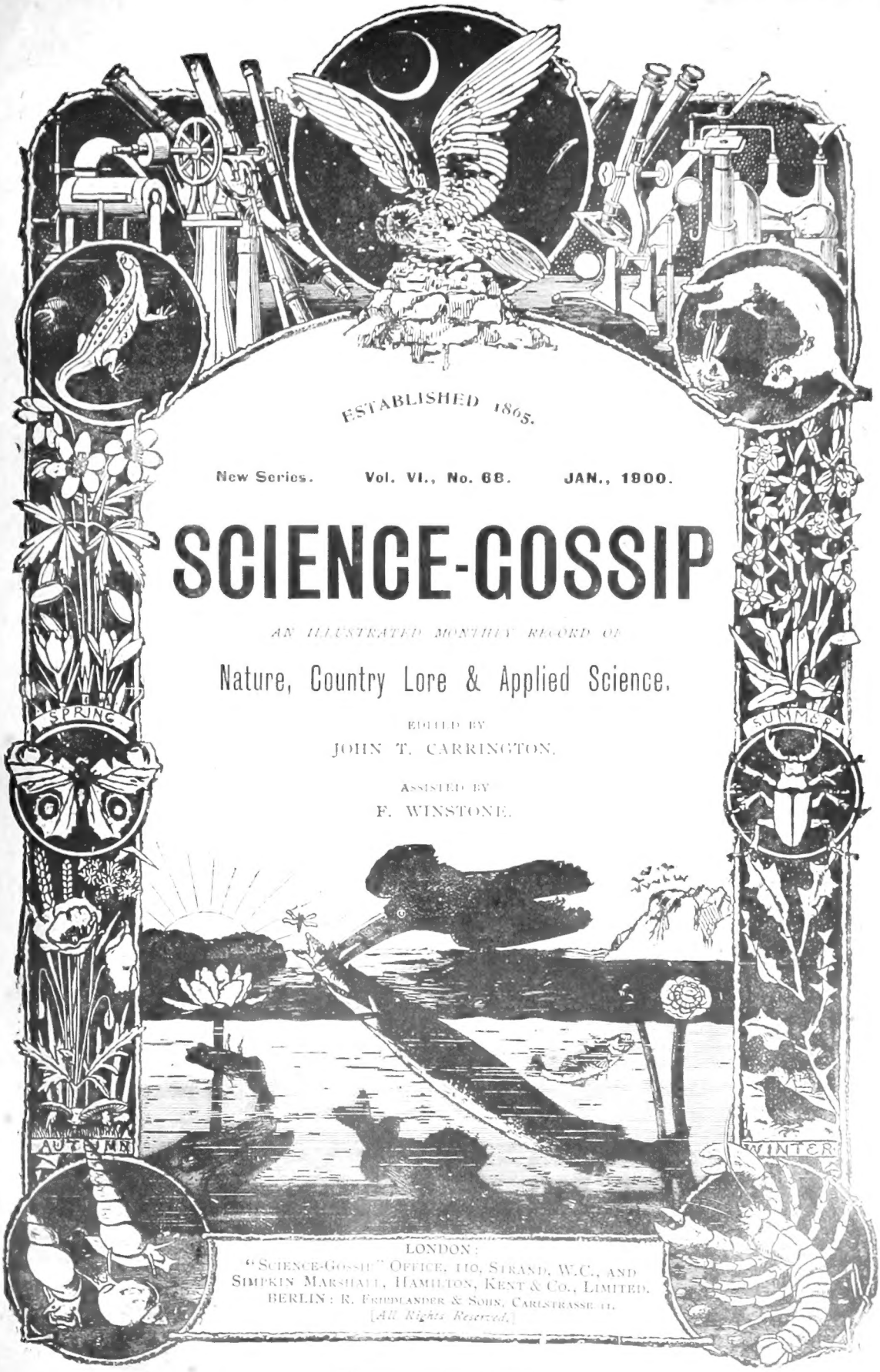

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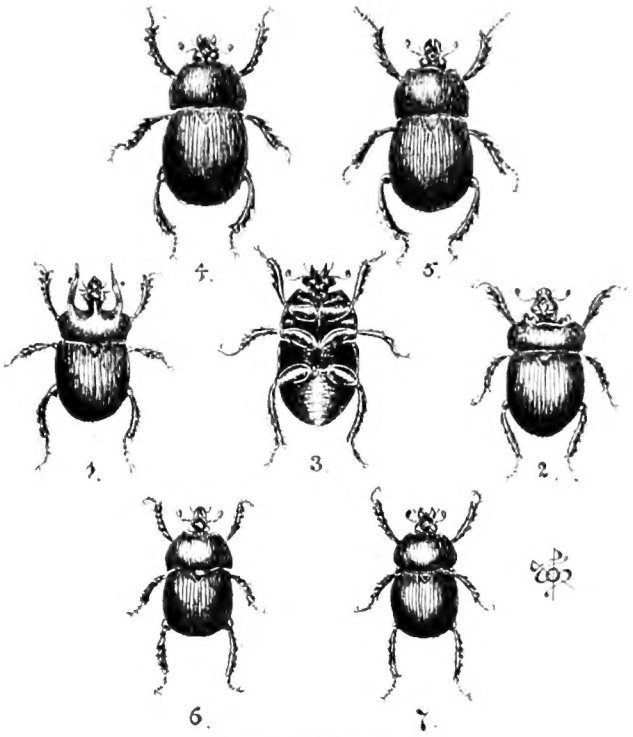
BRITISH DUMBLE-DORS.

By E. J. Burgess Sopp, F.E.S.

THERE are few beetles so universally well-known throughout Great Britain as those belonging to the genus *Geotrupes*, the several kinds being popularly designated "Dumble-dors"; for although one or two of the species are somewhat local in their occurrence, the genus is as a whole widely and generally distributed over the length and breadth of the land, from Lowestoft in the east, to the most westerly parts of Ireland, and from Dunnet Head, in Caithness, to Dorsetshire.

In the Munich catalogue more than six thousand species are enumerated, and since its publication several thousands have been added to the list. To this group belong the "Goliaths" of Western Africa, robust insects allied to the Cetonidae or rose-chafers, which frequently attain to a length of five inches, as well as the elephant beetles of South America, and other giants of the race.



British Dor-Beetles.

1.—*Geotrupes typhaeus* (male). 2.—*G. typhaeus* (female). 3.—*G. spiniger* (underside, showing smooth, bare, longitudinal space). 4.—*G. stercorarius*. 5.—*G. mutator*. 6.—*G. sylvaticus*. 7.—*G. vernalis*.

These beetles belong to the Scarabaeidae, one of the two families, into which for convenience, the Lamellicornia or "chafers" are divided. They form a group, perhaps the best defined, and one of the most widely known of the coleoptera, constituting as it does not only a division numerically important, but containing within its ranks many of the largest and most prominent members of the insecta, as well as some of the most beautiful and destructive beetles.

The name Scarabaeidae will, perhaps, be more familiar to most of us in connection with the Scarabaeus or "Sacred Beetle" (*Ateuchus sacer*) of the Egyptians, representations of which abound on many of their works of a bygone age. Scarabaei figure, in fact, amongst the very earliest examples of engraving on stone, having been regarded by the ancient Egyptians as symbolical of Pthah the Creative Power, and Phrah the Sun. The Phoenicians and Etruscans also carved them on sard, onyx, and other varieties of chalcedony. From chariots and

warlike subjects being often sculptured in intaglio upon the earliest productions of the latter people, it is conjectured they were sometimes bestowed as rewards and marks of favour upon their military heroes. The Scarabaeoid form for various ornaments of personal adornment, was at a later period introduced into Greece, whilst figures of this beetle were also worn upon the signets of the Roman soldiery as symbolical of manly courage, on account of its supposed birth from the male sex only. To the Scarabaeidae belong Aristophanes' Cantharus and other beetles of the Ancients, the habit of rolling balls of dung, in which were enclosed their eggs, common to many members of the group, having attracted the attention of observers from the earliest times.

The family has been variously divided by modern naturalists, but in Britain we follow the arrangement of Drs. Leconte and Horn, whose classification has been adopted by Canon Fowler in his monograph. In this arrangement, which is based upon differences in the structure and position of the lingula and abdominal spiracles, the group is divided into three portions termed (1) Scarabaeidae Laparosticti; (2) Scarabaeidae Melolonthini; and (3) Scarabaeidae Plevrosticti; each of which divisions is again subdivided into several tribes. With the two latter groups we are not concerned in the present article, but taking the first-named we note its members fall naturally into two great sections, the one having five and the other six ventral segments of the abdomen plainly visible. To the former of these belong the Trogina, the members of whose single genus *Trox* are found in dry decaying skins, hides, horns and like substances, whilst the latter comprises the three tribes Coprina, Aphodüna, and Geotrupina, nearly all of which are dung feeders. The Coprina, round-oval convex insects, of which over seventy species occur in Europe, are readily distinguished from the other two in having scarcely any visible scutellum, whilst members of the two remaining tribes may be separated from one another by the number of joints to the antennae, nine in the Aphodüna and eleven in the Geotrupina. Of the latter tribe, four genera occur on the Continent, of which two are found in Britain, viz., *Odontaeus* Klug. and *Geotrupes* Latreille. The first-named genus contains but one beetle, *Odontaeus mobilicornis*, an exceedingly rare insect, that has not been taken in England for many years. This brings us to *Geotrupes*, a genus containing considerably over a hundred species, widely scattered over the temperate regions of the globe, some fifty being natives of Europe, and seven indigenous to our own islands.

Although not so noticeable in character as some of the exotic members of the family, the habits of this genus have a special interest of their own. From very early times they appear to have attracted the attention of our leading naturalists, and even our poets have made mention of them in their verses. "The shard-borne beetle with his drowsy hum" (Macbeth III. 2) of Shakespeare, Crabbe, and Hogg, belongs to the dumble-dors, and is usually associated with *Geotrupes stercorarius* or one other of the commoner species. Authorities have differed considerably as to the correct spelling of the word "born" or "borne" and the meaning of the word "shard" as here employed. In his dictionary Dr. Johnson interprets the epithet "to be born amongst broken pots or stones," but Tollet holds that Shakespeare probably wrote "sharn-born"—sharn being a common name for cow-dung in Staffordshire and other Midland and Northern English counties. Again, not an inconsiderable number of commentators incline to the belief that the shards are the wing-cases and that the term refers to the method of carrying the elytra, which are poised aloft during flight; whilst yet others consider it was the common cockchafer (*Melolontha vulgaris*), and not the dumble-dor at all, to which Shakespeare referred (Patterson).

In the face of so many and varied criticisms it behoves one to be careful in advancing an opinion, but when we consider the life-history of the dumble-dor, we cannot help feeling that Dr. Johnson's interpretation as applied to this beetle is certainly not a happy one. In the light of further reference to shards in Anthony and Cleopatra (III. 2)—"Both he loves. They are his shards, and he their beetle"—and again in Cymbeline (III. 3), where Belarius, the banished lord, says: ". . . Often to our comfort do we find the sharded beetle in a safer hold than is the full-winged eagle." It certainly appears probable that Shakespeare used the term in connection with the wings or wing-cases.

In some parts of the country the *Geotrupes* are known as dor- blind- or clock-beetles, and in others as tumble-dungs and lousy watchmen. In referring to old natural histories, confusion may arise in connection with the first-mentioned name, as most of the earlier writers used it in describing *Melolontha vulgaris*. Tumble-dung is probably an Americanism, the term being applied in the United States to a closely allied species, and the "lousy watchman" obtains its name both on account of its being most in evidence after nightfall, and because it is often infested with numbers of little animals called *Gamasus coleoptratorum*. These parasites are yellowish white in colour and oval in form, and may commonly be ound attached to the underside of the beetle. They belong to the *Acarina*, or mites. In Denmark the peasants regard these little animals as furnishing an unfailing augury respecting their harvest time. If in spring the ticks are numerous between the front legs of the "Skarnbosse" (or "Torbist"), as the dor-beetle is there called, it is a sure prognostic that the in-gathering will be an early one; but if, on the contrary, they are mostly confined to its posterior portions, then will the harvest be late. Linné tells us (Syst. Nat.) that large quantities of *Geotrupes* on wing, during the evening, portend a subsequent fine day, but as Kirby has pointed out (Int. Ent.) they usually only fly in numbers during fair and settled

weather, although during the autumn, it is no uncommon thing to see one or two abroad, on nights when the weather is anything but propitious.

The dumble-dors of the genus *Geotrupes* are so well-known, and with one exception so much alike, that a very short description will suffice. They are large oval convex insects, very robust, sometimes measuring as much as an inch in length and one and three-quarters of an inch in girth. The thorax is broad and comparatively smooth, especially on the disc; the elytra more or less boldly striated. The legs are strong and adapted for digging rather than for feats of pedestrianism, the gait of the dumble-dor being both awkward and slow. For the size, its strength is enormous. This becomes apparent to anyone who tries to hold a beetle in the lightly closed hand.

Unlike so many of the chafers, the colouring of the upper aspect is of a dark and often unattractive hue. The undersides, which are in many cases clothed with shaggy pubescence, generally exhibit a bright metallic lustre partaking of some shade of blue, violet, green, or bronze.

Olivier asserts that no beetle can fly against the wind, but although this may be the case with many coleopterous insects, the statement is certainly inaccurate as applied to the order as a whole, the Cicindelidae and others, as well as members of the present genus, having often been observed to make satisfactory headway against a fairly stiff breeze. The flight of the dor-beetle is strong and swift, but seldom so straight as is that of the majority of the coleoptera. Its course is in arcs or segments of circles like the humble-bee, in which circumstance it is resembled by *Anomala frischii*, a beetle closely allied to the rose-chafer, whose flight curves are, however, usually longer.

Notwithstanding that they occasionally occur in decaying fungi and other substances, the Geotrupina are usually dung-feeders both in the larvae and imago forms. In the latter state their scent is keen, as behoves animals which have to seek their food in various and scattered directions. Having discovered suitable food, the dumble-dor alights on or near and immediately commences to burrow beneath, this work being generally performed by the female insect. If a piece of cow-dung in a field be raised and the ground examined beneath, it will probably be found riddled with several clean-cut, almost perpendicular, borings of about half to three-quarters of an inch diameter, and from eight or ten to perhaps over eighteen inches in depth, according to the nature of the soil and other circumstances. These are the homes of the Geotrupina. When the tunnel is complete dung is conveyed from the surface above to the bottom of the gallery, in which the female lays her eggs—one egg in each hole. In little more than a week the young larva is hatched, and immediately commences to feed upon the store provided. In appearance these larvae are soft, unattractive little grubs, curved about the middle so that their heads and "tails" approach one another. The general colour is a slaty-grey, becoming lighter towards the head and thorax, which latter parts are hard and corneous, partaking of a brownish hue. Having exhausted its larder the grub may either work its way to the orifice and procure more food before its change, or immediately assume the pupal form, according to the amount of sustenance stored by the parent, in which state it remains until ready a little later, to emerge a perfect beetle, fitted in every way to take its part in the important work of the propagation of its kind. Besides "the beetle's drowsy distant hum" during flight members of this genus have the power when at rest of producing a sharp shrill sound by rubbing the posterior femora against the apical extremity of the abdomen. This ability to emit a squeaking sound is shared also by *Copris lunaris*, an allied beetle, with many coleopterous and other insects. Dumeril (Trait. Elem. II. 105) compared the noise made by certain of the Longicornes to the braying of an ass, but no well-conducted and self-respecting dumble-dor has ever been guilty of thus expressing itself.

Before proceeding to consider in detail our various species of *Geotrupes*, mention may be made of the fact, that the well-provided retreats of the dor-beetles are often taken advantage of by other insects in which to lay their eggs. Especially is this the case with some of the smaller beetles of the tribe Aphodüna, *Heptaulacus testudinarius* being sometimes found in quantities at Ferndown in East Dorset, and possibly elsewhere, quite at the bottom of the burrows of *Geotrupes mutator* (Ent. Mo. Mag. March, 1898). *Aphodius porcus* is also said to frequent in like manner the subterranean abode of others of the genus.

(To be continued.)

VESPA AUSTRIACA IN NORTHUMBERLAND.—This year (1899) between June 21st and July 3rd inclusive, I captured, at Killingworth, near Newcastle-on-Tyne, four fine females or queens of this cuckoo-wasp. They were taken within a short distance of each other along the same warm, dry, loose-soiled hedge bank with southern aspect, as they flew along it, most probably in search of the suitable nest of a host in which to oviposit. All the spring and early summer the Rufous Wasp (*Vespa rufa*), which was by far the most abundant wasp of the season, had flown along and quartered inquisitively this same hedge bank, and it is not at all improbable that one or more of this host-wasp had founded a colony in the bank, as they were flying along it, though in fewer numbers, and had begun to rasp fibres from my garden poles. I had, though only for a short period before capturing the first specimen of the *Vespa austriaca* Panz., been keeping a look out for this parasitic species, as I thought that since the last season's broods of the *Vespa rufa* had evidently been fairly numerous, and the hybernating conditions obviously favourable to their conservation, it was probable both these circumstances would have acted in favour of the very closely allied inquiline, the *V. austriaca*, and that it, too, might now be on the wing in some numbers in search of a young colony of its host to whom the rearing of its offspring might be intrusted. I was not mistaken in the presence of this wasp.—*Charles Robson.*

RADIOGRAPHY.

By James Quick.

(*Continued from page* 204.)

Electric Lighting Currents.

When current is to be utilised from the supply mains, much care must be exercised. If the worker is not fully conversant with electrical matters he should take the advice of an electrical engineer upon the subject, otherwise he may get his induction coil burnt up, or may do other serious damage. Electric lighting circuits are run at different voltages,

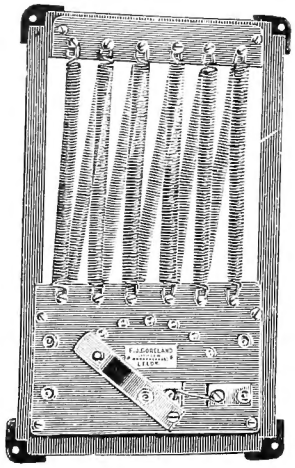


Fig. 14. Resistance Frame.

varying from 100 to 210, depending upon the company from whom the power is obtained. There are two principal systems of supply, by continuous, or by alternating currents. If the latter is the one at the experimenter's command, it will be necessary for him to transform it into a continuous current before proceeding to its use for his X-Ray work. For this purpose an alternating current motor, coupled to a small dynamo will be required. In either case, though, whether the supply iscontinuous or alternating, the voltage from the mains is much too high for induction coil work. If a coil were connected direct to the mains' terminals, it would be instantly deranged, owing to the excessive current that would pass through. Resistances or rheostats of some kind have therefore to be inserted in the circuit, to cut down the current to the required values.

Wire resistances are used in a great many instances, and they generally consist of spirals of bare iron, German silver or platinoid wire. These spirals are strung parallel to one another upon a suitable frame, as is shown in fig. 14. The left hand terminal of the frame is connected to the bottom of the left hand spiral, and the right hand terminal to the metallic lever of a switch, which can be made to pass over several insulated brass projecting pieces. These latter are each connected to the bottom end of a spiral. By this arrangement the resistance can be varied from that due to one spiral, to the total resistance of all the spirals in series.

It is difficult to obtain a satisfactory wire resistance arrangement such as the above, when, for experimental purposes, the current is required to be varied from very small to very large values. If the former is required, then the wire must be thin and its total length great, in order to obtain as high a resistance as possible to the current. If, however, a shorter length of this thin wire is taken, so as to increase the current passing through by thus diminishing its resistance, it will become hot and perhaps finally fuse. There is a maximum current that a wire of given diameter can take without becoming unduly heated; that is, its current carrying capacity is limited. To obtain a large current will therefore necessitate a thicker wire and a correspondingly greater length of it, and a single wire resistance frame, unless it be a large and cumbersome one, cannot be adapted satisfactorily to the extreme values of current.

A more suitable arrangement is provided by an incandescent lamp resistance. Suppose a 100-volt incandescent lamp of 16 candle-power (c.p.) is connected direct on to a 100-volt circuit, then the resistance of the lamp is such that the current passing through will be about 0.6 ampère. If two such lamps are placed in series the total resistance will be doubled, and therefore, by Ohm's law, the current passing through will be 0.3 ampère, and so on for any number in series. If two lamps are in parallel the total

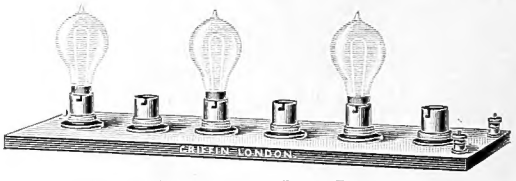


Fig. 15. Incandescent Lamp Resistance.

resistance will be one-half that in the case of the single lamp, and the current taken through will therefore be 1.2 ampères. If three are in parallel the current will be 1.8, and so on. If lamps of the same make and voltage, but of 32 c.p., are used, then one lamp will take about 1.2 ampères, and the above reasoning will hold good when two or more are coupled in series or in parallel. The greater the c.p. of a lamp the greater

the current it will take, and the greater will be the value of the latter passing round the rest of the circuit of which the lamp forms part.

It will be seen then that by some suitable arrangement for connecting up different lamps in series or parallel, or both, required values of current can be obtained. Two convenient instruments for this purpose are shown in figs. 15 and 16. In the former of these, two brass strips run parallel down the length of the base, and are each connected to one of the terminals. Between these strips are fitted lamp holders, so that by inserting a lamp in any one of them the circuit is completed through that lamp, and a certain strength of current passes. Two lamps of the same c.p. inserted will double the current, for they will be running in parallel. Each additional lamp increases the current, and the form shown in fig. 15 will take six lamps thus arranged.

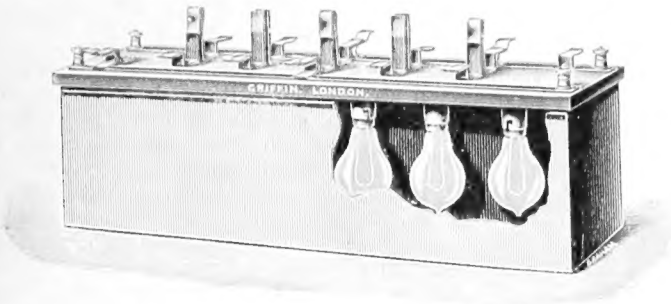


Fig. 16. Universal Lamp Resistance.

Fig. 17. Ammeter-Voltmeter.

In order to widen the application of these lamp combinations, a different set of connections may be resorted to, as is shown in fig. 16. Here the lamp sockets are connected to the brass springs seen on the top of the cover in such a way, that by properly bridging these springs across by means of connecting pieces, all or any of the lamps may be put in series or in parallel, or a series parallel combination may be obtained.

In both the above arrangements a further variation in the strength of current can be made by having a stock of lamps of different candle-powers, and which can be substituted for the others. The resistance shown in fig. 16 is provided with a zinc box in which the lamps hang. This box serves a double purpose: firstly, by filling it with water the instrument may be kept cool; secondly, it shields the surroundings from the light of the lamps—a desideratum, especially when doing fluoroscopic X-Ray work. Water resistances may be used, as a third variety, to cut down the current to the required values, but they are generally not so convenient or so cheap as the other two forms.

In addition to a proper resistance an X-Ray outfit will not be complete without a voltmeter, and an ammeter, with which to measure the potential and current respectively—especially if the supply from the mains is used. These instruments are made in various forms, either for use in a vertical or a horizontal position. One of the former patterns is shown in fig. 17.

In connecting up these instruments in circuit, the ammeter is placed in series with the source of supply and the induction coil, but the voltmeter is connected as a shunt across the terminals of the coil and break, and should not be allowed to remain in circuit permanently.

Before leaving the subject of the mains supply current, a few more words may be said upon the use of the Wehnelt break already described (*ante*, p. 202). It has been asserted that this break may be connected with a coil direct to the continuous supply terminals, and without any intervening resistance. Unless, however, the operator is quite easy in his

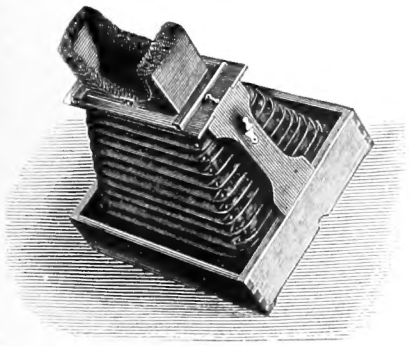


Fig. 18. Fluoroscope Extended.

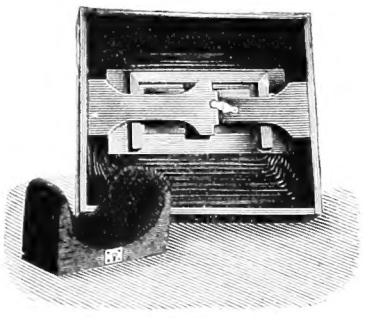


Fig. 19. Fluoroscope Closed.

mind as to ts working, the writer would strongly advise him for safety sake, to first insert a resistance which may be gradually cut down as required, otherwise serious consequences to the coil may accrue. Certainly for a large coil, say one giving a 20-inch spark, not more than 15 ampères should be sent through, and of course a smaller current for smaller coil.

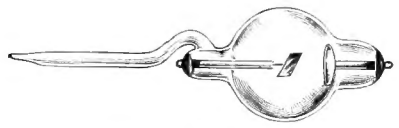


FIG. 20. X-RAY TUBE.

FLUOROSCOPES.

When examining a patient by means of the fluorescent screen (*ante*, p. 135), it is sometimes found very inconvenient to shield the screen from external light, such as that from the windows or even from the spark made at the break belonging to the coil. Instruments have been devised to overcome this difficulty and are known by a variety of names such as fluoroscopes, radioscopes, kryptoscopes, etc. Such a one is shown in fig. 18. It consists of a camera bellows fitted to a frame, in one end of which the fluorescent screen is made to slide. The front end of the fluoroscope is fitted with a fur-lined aperture to receive the observer's eyes. The arrangement is portable folding up into a small compass, as is seen in fig. 19. These fluoroscopes are a boon to radiographers, as the conditions of various parts of the body may be viewed easily in the daytime.

THE X-RAY TUBE.

We come now to discuss the last, but certainly not the least important accessory to an X-Ray outfit—the X-Ray vacuum tube. Except in detail, the form of the tube now in general use does not differ from the original pattern of Mr. Jackson, of King's College. This, as is seen from fig. 20, consists of a concave aluminium cathode, and a piece of sheet platinum as

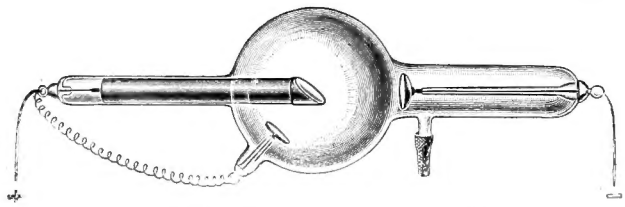


FIG. 22. SPECIAL X-RAY TUBE FOR STRONG DISCHARGES

anode, supported about the middle of the glass bulb and inclined at an angle of about 45° to the line joining the anode and cathode. The tube is exhausted very highly, otherwise no X-Rays will be produced, yet not too highly to prevent electrical discharges passing through at all. When a discharge takes place through the tube, and if the aluminium cup is made the cathode, the cathode rays emanating from the cathode impinge upon the platinum anode or anti-cathode, as it is called, and are scattered out through the glass as Röntgen rays. In a later form of tube there is an aluminium anode in addition to the anti-cathode, but it is the latter that receives the bombardment of the cathode rays. When used, this form of tube has the anode and anti-cathode connected together outside, so that both are in communication with the positive terminal.

When working with these forms of X-Ray tubes, two difficulties present themselves. Firstly: under different conditions of working and different spark lengths, the one tube with its one degree of exhaustion and one value of resistance cannot be adapted. Secondly: upon continued working, it is found that the exhaustion, and therefore the penetrating value, of the tube increases, so that finally, in spite of repeated heatings by a Bunsen flame or other source, to increase the pressure inside, the resistance of the tube becomes so high that the electrical discharge will not take place under the same conditions for which the tube was originally selected.

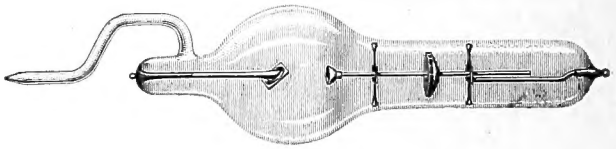


FIG. 21. ADJUSTABLE CATHODE X-RAY TUBE.

These difficulties have been overcome, chiefly owing to the work of Mr. A. A. C. Swinton, whose results upon the *modus operandi* in the interior of the tube, also upon the conditions affecting the emission of X-Rays, have proved of very great importance in the work. Among other things Mr. Swinton found, with experimental tubes made in his laboratory, that if the anode of the tube be so arranged that the distance between it and the cathode could be adjusted, then a ready and very simple means was at hand whereby the resistance and penetration could be altered to suit the varied conditions imposed. The nearer the anode is placed to the cathode the higher the resistance, and consequently the higher the penetration of the tube, and *vice versâ*. In moving the anode of a tube, however, the point of origin of the X-Rays is also moved for each adjustment, which is certainly a disadvantage, especially when a difficult radiograph, requiring a lengthy exposure, is being taken. While, therefore, taking advantage of Mr. Swinton's very useful principle of varying the distance between anode and cathode, Dr. Dawson Turner, in conjunction with the writer, reversed the arrangement by making the cathode movable and keeping the anode fixed. They added a further

modification in that the cathode is adjusted by external magnetic means, so that movement may easily be made without disturbing the tube at all while it is in any desired position.

This tube, as is shown in fig. 21, is so constructed that the cathode in its movement slides in and out of the side annex blown in the bulb, and is kept in proximity to the glass throughout its movement; for it has been found that the latter has a greater influence upon the resistance of the tube than mere movement to and fro when the cathode is quite out into the bulb space, and it affects it in the reverse way: that is, the nearer the cathode is to the anode the lower the resistance, and this increases again as the cathode is gradually drawn back inside the annex. The figure shows an earlier pattern of this tube, in which the cathode moves out into the centre of the bulb space. The present form, however, is arranged so that its action depends upon this proximity of the cathode to the glass.

Unless the anti-cathode of an X-Ray tube is backed by an additional block of metal to conduct away the heat, it sometimes becomes red hot and even melts, owing to the bombardment of the molecules upon it—especially if the tube is in use with a large coil. All well-made tubes are now so constructed, but special ones are manufactured for the largest coils, and in cases where the Wehnelt break is used, since the latter produces an excessively strong discharge. Such a tube is shown in fig. 22, where it will be seen that the anti-cathode is connected to a large copper tube which extends almost to the end of the annex tube, which therefore offers a large mass and also a large area for radiation; both of these conditions helping to keep the anti-cathode cool. Although this tube has only been brought forward this year, the idea is not quite a new one, as similar tubes were constructed in 1897, to Professor A. P. Chattock's designs.

Yet another tube has lately been introduced with this end in view, namely, keeping the anti-cathode cool. A hollow platinum cone, which serves as an anti-cathode, is sealed into the X-Ray bulb; but the inside of the cone is in communication with the external air. It can therefore be filled at will with cold water, which prevents the surface of the anti-cathode becoming unduly heated. When the temperature of the contained water rises to boiling point, fresh cold water is substituted. The amount of platinum required in this tube renders it expensive.

(To be continued.)

OPIUM,

ITS SOURCE, VARIETIES AND COMPOSITION.

By Lewis Ough, F.L.S. F.C.S.

(*Concluded from page* 198.)

PROBABLY in no medicinal product has a greater variety of foreign substances been at one time or other detected as adulterants, principally to increase the weight of the opium. All are readily detected by careful examination, including chemical and microscopic analysis. I have personally found bullets and stones in Turkey opium, together with such substances as clay, sand, starch, dried leaves, extract of lettuce and extract of poppies. The last named is obtained by boiling crushed poppy heads in water, then evaporating the dark coloured decoction thus obtained.

With regard to the chemical composition of opium, the activity of the drug is principally due to the vegetable alkaloid morphine. The yield of morphine from Turkey opium is from 8 to 17 per cent., the average being 10 per cent. Below this it is considered inferior and not suitable for medicinal purposes, being probably adulterated. As an alkaloid, morphine is of great interest historically, having been the first discovered of this now most important class of bodies. It exists in the drug in combination with sulphuric and meconic acids. Lactic acid has also been found but that is generally believed to have been formed in the opium after its collection by a process of fermentation. By some chemists, however, this is believed to be a slightly different compound and it has been named theobolactic acid. In addition to morphine the following alkaloids of opium are of more or less importance:—narcotine, 7 per cent.; codeine, 1 per cent.; narceine, 1 per cent.; meconine, ¾ per cent.; papaverine, thebaine, cryptopine, and several others. Meconic acid is present to the extent of about 5 per cent., and the remainder of the bulk is made up with resin, gummy matter, mucus, water, fatty matter and caoutchouc. The proportion of the latter present has probably some bearing on its value for smoking purposes, as the Chinese estimate the drug roughly by the touch, *i.e.*, the rapidity or slowness with which a thread drawn out from the mass will break by its own weight. The amount of morphine in Persian opium is very variable, some yielding from 8 to 13 per cent., whilst other kinds yield below 1 per cent. Indian and Chinese opiums are also very

low, viz., from 3 to 7 per cent. The percentage of this alkaloid bears no relation to the preference exhibited by smokers. That containing a large amount is by them generally considered inferior and liable to cause headache. Opium dried as soon as it is gathered is richer in alkaloid than if kept in the moist state for some time and exposed to the air. It is also stated that the drug twenty years old contains less alkaloid, than when previously analysed in the fresh state; but this statement, I think, requires confirmation.

Medicinally the most extensively used preparation is the tincture, generally known as laudanum, a name which was first applied to a solid preparation combined with aromatics. The liquid preparation appears to have been introduced with these aromatics by Dr. Sydenham, and was inserted in the London Pharmacopoeia of 1721. Ordinary medicinal opium loses about 20 per cent. of water when dried and this should yield about 8 per cent. of ash, 60 per cent. of the dried drug being soluble in cold water. Opium should be tenacious, yellowish brown in colour, with a strong narcotic odour and bitter taste. A derivative of morphine obtained by heating the alkaloid in a sealed tube with hydrochloric acid is known as apomorphine. This is one of the most speedy and effective emetics, especially when injected hypodermically.

The sedative property of opium is so well known that I need not enlarge on this point. Its position as a drug is such that Pereira describes it as the most important and valuable medicine in the whole *materia medica*, and the source, by its judicious employment, of more happiness, and by its abuse, of more misery, than any other drug used by mankind.

The use of opium in the East as a stimulant and intoxicant, as before stated, consumes nearly the whole of the quantity produced. The Turks chew it and the Chinese smoke a watery extract under the name of chundoo, the preparation of which from the crude article constitutes a special business. As a drug it is frequently somewhat uncertain in its action, many people being able from idiosyncrasy, but more frequently from previous indulgence, to take a much larger amount than others. The smallest dose known to have proved fatal with an adult is four grains, in contrast to which may be quoted a young man who not only swallowed sixty grains of Smyrna opium night and morning for some time, but also in addition drank 1½ ozs. of laudanum daily. Another case is cited by a doctor, where a wineglassful of the tincture had to be administered several times in twenty-four hours. The drugging of children either with the view to destroy life, or to produce continual narcotism is especially rife in India, the method of administration being usually to smear a little of the solid substance on the tongue or the roof of the mouth. In our own country the use of such substances as soothing syrups, infants' preservatives and such like substances, produces considerable mortality in infant life, children being far more susceptible to the influence of opium than to any other drug.

It is usually understood that where poisoning by opium is suspected, it is sufficient to detect the presence of meconic acid to establish that of opium. Pills and other solid preparations betray the presence of the drug by the odour they emit, and in most cases there is no great difficulty in isolating morphine, with probably one or two of the other alkaloids as well as the meconic acid. The last named giving a characteristic red colour with a solution of chloride of iron. This is not obtained with any other alkaloidal acid. Morphine, too with this re-agent, gives a very distinctive blue colour, peculiar to itself.

Whilst the juice from the unripe pericarp of the poppy has been proved to possess such active properties, the seeds are bland and wholesome, the dark-coloured ones called maw seeds, being largely eaten by birds. Besides woody fibre, the capsules themselves contain small quantities of the principles found in opium.

Poppy oil obtained from the seeds of both the black and white varieties, is an article of some importance. By cold pressure from 30 to 40 per cent. of a white virgin oil is obtained, bland and pleasant to the taste, being almost without odour. On a second pressure with heat, a further 20 per cent. is yielded of a reddish colour, possessing an acrid taste and a linseed-like odour. The oil belongs to the drying or linoleic series, having a greater drying power than raw linseed oil, and on this account is a valuable and much used medium for oil painting purposes. The fine quality, extensively used in Germany as a salad oil, is less liable than that of olives to rancidity, while its freedom from flavour leads to its use as an adulterant to that oil. In India and some other countries, poppy oil is much valued as a food, and for other domestic purposes. The inferior kinds are principally employed for making soap and varnish. After pressure the remaining cake constitutes an article of diet in most opium producing countries, besides being largely used to fatten cattle.

Curzon Terrace,
Leicester.

BATS IN LONDON.—Mr. Dennett reports that on October 19th he found a crowd of boys watching two bats flying about in St. John's Road, Hoxton, London, N.

UNUSUAL BLOOMING OF HAWTHORN.—I enclose herewith a specimen of hawthorn (*Crataegeus oxyacantha*) found in bloom yesterday, November 26th, in a hedge just outside this town. It was in a very exposed position, facing due east. As you will see, there are only two blossoms springing from a fork of the twig, and at first sight I thought it was blackthorn, there being no leaves; but a closer inspection as well as its perfume declare it to be true "may." Its occurrence in flower at this unusual time of year, may be of interest to some of your other readers besides myself. —*T. E. Dogg, Evesham.*

BRITISH FRESHWATER MITES.

By Charles D. Soar, F.R.M.S.

(Continued from page 210).

GENUS *HYDRYPHANTES* KOCH.

THERE are several species of this genus recorded by various authors from different parts of the world. Five are described by Piersig from Germany, but at present I can only record two from Britain, both of which are fairly common.

The chief characteristics of this genus are:—Body soft skinned. Legs well supplied with swimming hairs. Claws to all feet. On the frontal portion of the dorsal surface is a chitinous plate, which is very conspicuous in all species.

1. *Hydryphantes ruber* de Geer.

Female:—Body oval. Length about 1.80 mm., breadth 1.32 mm. Skin coarse and granulated. A number of dermal glands are distributed over the dorsal surface. Colour scarlet; in some cases very dark, in others very pale. On the anterior portion of the dorsal surface is a chitinous patch or plate, which has the appearance of having been riveted to the

Fig. 1. *Hydryphantes ruber*. ♀ Dorsal Surface.

skin of the body at each corner (fig. 1). On the median line towards the front of this plate is a small, dark spot that has the appearance of being a fifth

Fig. 2. *H. ruber*. Genital Plates.

eye. This median eye is also found in one or two species of *Thyas*, so it is not peculiar to this genus. This plate is thick and granulated, and forms one of the principal points of identification in the species of the genus. The contour of this plate varies a little in different specimens of this species. I have four specimens before me, all varying a little, but not enough to make the recognition doubtful. The eyes on each side of this dorsal plate are close on the margin of the body, and are halved in a very decided manner, giving a distinct pair of eyes to each. The eyes are small, prominent, and very dark.

Legs.—First pair about 1.28 mm. Fourth pair about 2.0 mm. Same colour as body, very strong and very hairy (fig. 1). All the feet have claws. There is no difference in the leg structure in males or females, as in some of the genera before noticed.

Epimera.—In four groups, strong, distinct and very hairy.

Palpi.—About 0.52 mm. Fourth segment longest. It has no peg on the second segment, or fourth, but the first three segments have a number of pectinated hairs.

Genital Area.—Composed of two plates. At each end of each plate is a conspicuous disc. There are also two others (see fig. 2) partly covered with the plates, which in some cases cannot be seen at all, being wholly covered. In others, the plates are so open that the whole of the disc is exposed.

Localities.—Fairly common in England. Dr. George has found it in Lincolnshire. I have taken specimens at several places around London, and Mr. Taverner reports it in Scotland.

2. *Hydryphantes dispar* Schaub.

This mite can easily be recognised from the preceding species by the dorsal plate (fig. 3). In all

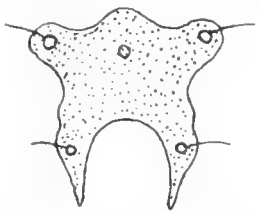


Fig. 3. *H. dispar*. Dorsal Plates.

other respects it is similar to *H. ruber*, even in its measurements. I do not think any further description necessary.

Localities.—It is very common. I took large numbers at different places in England in 1897. Mr. Taverner this year sent me some from Scotland.

GENUS *SPERCHON* KRAMER.

This is another genus that contains several species abroad, but at present I have only two to record for Britain. One of these is very common, and the other is very rare.

The characteristics of this genus are :—Body soft skinned. Legs without the long swimming hairs. Claws to all tarsi. Epimera in four groups. Eyes wide apart. Three discs on the inner edge of each genital plate.

1. *Sperchon squamosus* Kramer, 1879.

Body.—Oval. Colour yellow, with brown markings. Skin coarse and covered with papillae, or scales as suggested by the name given by Kramer. Length about 1.04 mm. Breadth about 0.84 mm. On reference to figure 5, it will be seen that the rostrum in this Hydrachnid is pushed forward some distance

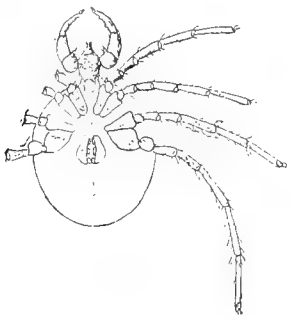


Fig. 4. *S. squamosus.* Ventral Surface, Female.

in front of the first pair of epimera, even as much as 0.28 mm., giving this mite a very singular appearance. All the species of the genus have more or less this character. Koenike has found one species which thrusts the rostrum very little forward, and named it *S. brevirostus*, but at present this one has not been found in Britain.

Legs.—First pair about 0.52 mm., fourth pair about 0.92 mm. They have a number of short hairs, but are quite without the long swimming hairs we find on the legs of *Hydryphantes* and others. Colour a pale yellow. All feet have claws. Although without the long so-called swimming hairs, they are very strong swimmers and move in the water at a fairly quick rate of speed.

Epimera.—In four groups and rather small in proportion to size of body (fig. 5).

Palpi (fig. 6).—Length about 0.42 mm. Second segment is very thick and furnished with a

Fig. 5.
S. squamosus. Palpus.

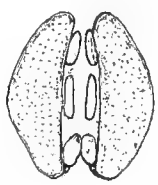


Fig. 6.
Genital Plates, Female.

peg. Fourth segment has the small pegs or projections on the inner edge.

Genital Area.—Composed of two plates, about 0.12 mm. in length. On the inner edge of these are three discs (fig. 4).

Localities.—Not common. Found in Epping Forest by Mr. Scourfield and in Lincolnshire by Dr. George.

2. *Sperchon setiger* ? Thor, 1899.

Body.—Oval in shape. Length about 1.20 mm. Breadth about 0.92 mm. Colour, straw yellow with brown markings. The surface dorsally is covered with a quantity of dermal glands, which vary in size, but are all very conspicuous.

Legs.—Very much like the preceding species. First leg about 1.20 mm. Fourth leg about 1.64 mm., with plenty of short hairs, but without the long swimming hairs.

Epimera.—In four groups like the *S. squamosus*, but the posterior pair are a little larger.

Palpi (fig. 7).—The two last segments very long

Fig. 7. *S. setiger.* Palpus.

and slender, being 0.88 mm. in length. These palpi are the principal point of indentification. Previous to seeing Thor's figure, I had always taken this mite to be *Sperchon glandulosus* Koenike, although I queried it, because I could never satisfy myself about the two small bristles on the inner edge of the third segment, as neither Koenike or Piersig had drawn attention to them. Thor, in his figure, which quite agrees in other particulars with the figures of *S. glandulosus*, has drawn three distinct bristles on the inner edge of the third segment. There are three distinct bristles on my examples, but one is situated a little further back from the inner line.

Localities.—Common in England. I took about twenty specimens in Suffolk, in 1897. Mr. Taverner has also found several specimens in Scotland.

(*To be continued.*)

Vegetarianism.—An ex-vegetarian, Mr. Hector Waylen, has in a contemporary given the conclusions to which he has come after some years' trial of vegetarianism. He says after eight years' abstinence from all flesh food he arrived at such a low condition, he was compelled to take meat three times a day, and beef-tea in addition. Mr. Waylen also reminds us "that animal tissues supply most easily the analogous tissues in man. Vegetarians burden their digestive organs with masses of crude stuff, practically deprive themselves of fats and oils, and then think, while they daily grow thin and nervous, that they are improving in health. When the human body is starved it begins to feed upon itself as a camel does upon its hump, and vegetarians are thus themselves guilty of a species of cannibalism." The writer further reminds us that "food reformers" are not consistent. He states "They seem quite to forget how highly organised plants are, and while they shrink from killing a sheep they have no regard for the tender sensitiveness of Brussels sprouts or cauliflowers."

A HISTORY OF CHALK.

By Edward A. Martin, F.G.S.

(Continued from page 199).

Cretaceous Strata Older than the Chalk.

SUCH accumulations of sedimentary matter that can be grouped under the Cretaceous System, by the affinities of their respective fossiliferous remains, cannot be considered, geologically, of very ancient date in the world's history. It is true they were accumulated many aeons ago, at a time long before the advent of any of the existing species of animals, and therefore ages before the appearance of man upon the earth. As compared, however, with the age of the rocks formed in Pre-Cambrian or Cambrian times, the cretaceous rocks are but of yesterday's date. The oldest sedimentary formations of which we have any certain information, have been in existence so long, and have had so many welding forces brought to bear upon them, that, while we are able to isolate the cretaceous as a separate system, extending at most to a thickness of about 4,100ft. from the base to the top, yet the characters in the more ancient rocks are so uniform, and so crystalline, and the fossils have been so altered, that we have no means of grouping those strata, except by placing in a single system so large a thickness of strata as 50,000ft. in the case of the Laurentian in America, and 30,000ft. in that of the Cambrian, including Ordovician. It will thus be seen that the various "systems" are very far from being of uniform thickness, and as a matter of fact, we find they decrease in the thickness of their contents as approach is made to the present day.

The group of strata known as cretaceous is met in the sequence of geological history at the top of the Mesozoic systems. Its true position will be seen the more easily by a glance at the following list of formations:—

Tertiary or Cainozoic	Pleistocene.
	Pliocene.
	Miocene.
	Oligocene.
	Eocene.
Secondary or Mesozoic	Cretaceous.
	Neocomian.
	Jurassic.
	Lias.
	Trias.
Primary or Palaeozoic	Permian.
	Carboniferous.
	Devonian.
	Silurian.
	Ordovician.
	Cambrian.
	Pre-Cambrian (Archaean).

With the progress of geological discovery, it has been found that these divisions, although convenient for systematic purposes, are scarcely bounded by any hard and fast limit. "Passage-beds" are constantly being discovered, which unite in themselves fossil affinities, on the one hand to the strata above, and on the other to those below them.

It must not be imagined that the familiar rock known as Chalk is the sole constituent of the Cretaceous formation. In fact, in Great Britain this system contains, in about equal proportions, calcareous, argillaceous, and arenaceous strata.

The Chalk, although so well-marked a sub-division, is thus of no greater geological importance than any of the others, but from familiarity, it has come to be regarded as the most prominent member of the system, whilst from the beauty and perfection of its fossils, it will ever remain to the collector one of the most attractive of geological strata.

It will have been noticed in the arrangement given above, that we have adopted the classification that places Neocomian beds on the list as a separate formation. The beds classified under this heading are those known as the Wealden beds and the Lower Greensand. They are still classed by some geologists as Lower Cretaceous. The fresh-water Wealden beds are regarded, in their upper part, as having been built up in an estuarine sea, whilst the Lower Greensand, at least in some parts, was contemporaneously forming in an oceanic area. There is no doubt, however, that the latter formation is divided from the Chalk in point of time, by a far greater interval than had formerly been imagined. The general opinion is that it should be separated from the Cretaceous, and classed as a distinct system under the title of Neocomian; this title also including the Purbecks and the Wealden. There is no definite sequence between the three, but there is another formation, away from the then disturbed area of the South-east of England, which represents to us in a most fortunate manner, the regular succession of life during this period, from the close of the well-defined Kimmeridge Clay to the early days of the Gault. This is the Speeton Clay of the Yorkshire coast. It there attains a thickness of nearly 300ft. After examination, it has yielded evidence of being divisible into well-marked zones. These zones represent phases of life at different periods, which correspond closely with the succession of Portland Beds, Purbecks, Wealden, Lower Greensand, and early Gault, and may be connected with them as follows:—

Zone of *Belemnites minimus*=Gault.
,, *B. semi-canaliculatus*=Lower Greensand.
,, *B. jaculum*=Wealden (apparently).
,, *B. lateralis*=Portland and Purbeck Beds.

(To be continued.)

BUTTERFLIES OF THE PALAEARCTIC REGION.

By Henry Charles Lang, M.D., M.R.C.S., L.R.C.P. Lond.

(Continued from page 209).

PARNASSIUS (continued).

9. **P. insignis** Stgr. S. E. Z., p. 194. Aust. Parn., 106, pl. IV., fig. 1. R. H., 97 (*discobolus* var.).

70—75 mm.

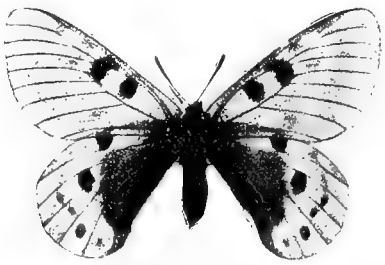
Closely resembles *P. discobolus*, but is somewhat

P. apollonius var. *alpina.*

larger, especially ♀. Purer white and more strongly marked and brightly coloured. Red spots on f.w. very vivid. Basal and ante marginal markings of h.w. more decided than in *P. discobolus*. ♀ with a red spot near an. ang. h.w. not seen in *P. discobolus*. Abdominal pouch broader than in that species.

Hab., Transalai and S. Altai.

a. var. *tianschana* Stgr. Larger, but resembles type, which apparently it replaces in Tianschan. It is larger in expanse, and whiter than is *P. discobolus*. ♀ with red spots at an. ang. h.w.



P. delphius.

10. **P. romanovi** Grum-Greshimailo in litt. Aust. Parn., pl. X., fig. 3. R. H., p. 97 (synonym for *insignis*).

65—70 mm.

Close to *P. insignis*, but smaller, wings purer white. Red spots, on all the wings, large and bright. Black markings, especially those of h.w., in ♂ very strongly marked. ♀ without much basal shading in h.w., compared with what is seen in allied forms. However, the basal shading in the ♂ h.w. is darker and more extensive than in *P. discobolus* or any of its varieties. There is a faint trace of a red basal spot in the ♂ h.w. Abdominal pouch in ♀ narrower than in the last.

Hab., Transalai.

11. **P. rhodius** Honr. B. E. Z. 1882. Aust. Parn. 96, pl. IX., figs. 1, 2, H. R.

55—58 mm.

Very much resembles *P. actius* in size and general appearance, but at once to be distinguished from it by the presence of a red spot at base of h.w. Beneath, the basal red blotches of the h.w. are much larger, brighter and more distinct. The apex of f.w. is more rounded, and similar to those of the next species, *P. honrathi*. ♀ duskier in colour, but more transparent than *P. actius* ♀, with the basal patch h.w. more extended, and the ante-marginal band broader and more continuous.

Hab., Alai Province of Kokand, Osch (W. Turkestan).

P. delphinius var. *infarinalis.*

12. **P. honrathi** Stgr. B. E Z., 1882. Aust. Parn. 108, pl. X., fig. 1, XI. 2.

61—67 mm.

Apex of f.w. more rounded than in *P. discobolus*, ante-marginal band extending to in. marg., white spots between this and marginal band larger. Outer costal and in. marg. spots more broadly red, but lighter in colour. H.w. with a basal red spot, and a red spot at anal angle in both sexes. Hind marginal spots not chevron-shaped. Bases more broadly, but more faintly black. Red costal and central spots white-centred. ♀ larger than ♂, somewhat more dusky, abdominal pouch narrower than in *discobolus*. The colour of the red spots is less brilliant than in ♂.

Hab., Turkestan, Samarkand (Hazreth), Bokhara, Sangi Djuman, Kuli-Kalan (Zarafehan), 7,000 to 8,000 feet (H. R.) V., VI.

The four species above described are very closely allied, but not more so than many of the species of *Melitaea* and *Erebia* or *Syrichthus*, and less so than

some of the British species of Lepidoptera are to their congeners, such as *Acronycta psi* and *A. tridens* or some of the genus *Cucullia*. Even such forms as *Zygaena lonicerae* and *Z. trifolii*, *Catocala sponsa* and *C. promissa*, *Plusia iota* and *P. pulchrina* are as close to one another as any one of these Parnassii to its proximate species.

13. **P. bremeri** Brem. Lepidopteren ost. Siberien 1864. Stgr. Cat. 1871. Aust. Parn. 124, pl. XIV., fig. 2.

65—70 mm.

The wings are all more elongated and less rounded than in the preceding species, more densely covered with scales, and ground colour white, with a slight

P. cardinal ♂

tinge of cream colour. The neuration is strongly marked, producing somewhat the effect seen in "the

P. cardinal ♀

black-veined white" butterfly (*Aporia crataegi*). F.w. with two well-marked black subcostal spots, the two outer ones being much less defined, marginal subdiaphanous band very narrow, in some specimens almost absent. Sub-marginal band grey rather than black, wavy and reaching to about half the length of the ou. marg. In. marg. spot present, but ill-defined, at least in ♂. H.w. ou. marg. without any markings. In. marg. deeply black, the usual costal

P. graeseri. Abdominal Pouch
Aust. Pl. 2. Fig. 1).

and central red spots are bright scarlet, well marked but small, with black rings. There is a well-marked red spot at the base. U.s. as above, but with fainter markings, the scarlet spots of h.w. are vivid, and there are four basal spots of a similar colour. A faintly-indicated spot at an. ang., with a trace of red in some specimens. ♀ resembles ♂, but rather more strongly marked. U.s. h.w. with two red spots near an. ang. Abdominal pouch much as in *P. apollo*, but rather broader.

P. charltonius.

Hab. The Amur, throughout which it is widely distributed in Alpine regions. Ask., Bik., Uss. and Sutschan (Stgr.), Mt. Bureja (H. R.). V., VI.

Larva.—"Velvet black, more slender than that of *P. apollo* and *P. nomion*. Studded with a number of small sulphur-yellow spots" (H. R.). On various species of *Sedum*. V.

14. **P. graeseri** Honr. B. E. Z. 1885. Aust. Parn., pp. 127, 172, 198, pl. XIX., 3, II., 1, suppl. Abdominal pouch, pl. I., fig. 1, suppl., *bremeri* var. H.R., p. 101. Stgr. Roman. 1892, p. 55.

Differs from *P. bremeri* in the whiter colour of the wings and in the greater intensity of the markings,

P. charltonius var. *princeps*.

an ante-marginal band being present on f.w. and h.w. of both sexes. F.w. with one or two red subcostal spots in ♂ and from two to four in ♀. Abdominal pouch in ♀ according to Aust. differs entirely from that of *P. bremeri*.

Hab., Transbaikal, between the sea of Baikal and the Amur river. Pokrofka VI. At an elevation of from 4,500 to 8,000ft.

Dr. Staudinger and the German entomologists, consider this only a septentrional variety of the last

species, as its habitat is confined to the northern part of the Amur; but Austat gives it specific rank, and figures the abdominal pouch. I have not myself seen a specimen of *P. graeseri* ♀, but following Austat I admit this form as a good species.

15. **P. apollonius** Eversm. Bull Mosc., 1847. Aust. Parn. p. 120, pl. XV., figs. 1, 2.

64—72 mm.

Ground colour of wings pure white in ♂ except at inner margins which are black, but not broadly so. In the ♀ the wings are sparsely sprinkled with black scales, which give them a dusky appearance. Subdiaphanous area at apex of f.w. very slight in ♂, more extensive in ♀. All the wings in both sexes have an ante-marginal row of small black spots or dots, not seen in any other *Parnassius* except *P. tenedius*, which is a much smaller butterfly. F.w. with the usual sub-costal spots, the two internal ones always

P. tenedius.

black. From one to two external spots with red centres, occasionally in ♀ a third red spot. Inner marginal spot nearly always marked with red. Out of eight specimens in my collection only one is without a red centre to this spot. H.w. with the two usual red spots, often pupilled with white, a red basal spot in both sexes, but no red centre to that at anal ang. n the typical form. Antennae black, without white

P. bremeri. Abdominal Pouch (Aust. Pl. 8. Fig. 5).

rings. ♀ Abdominal pouch long and narrow, but otherwise resembling that of *P. apollo*, etc. U.s. as above but fainter. H.w. with two basal red spots and one on inner margin.

This species is unfortunately liable to "grease."

Hab., Songaria VI., Kouldja, Margelan VII., The Salt Steppes of Turkestan III.—V. At considerable elevations.

Larva, resembles that of the Parnassii generally. "Velvet black, on every segment two bright red spots, forming a longitudinal stripe on each side." (H.R.) Food plant *Salsola* and *Scabiosa*. V.

a. ab. *flavomaculata* Stgr. in litt. Aust. Parn. pl. XV., fig. 3. This is a form analagous to the yellow spotted *apollo* found in Andalusia. It differs from the type in the colour of the ocelli, which are orange-yellow in place of red. Hab., Tianchan.

b. var. *alpina* Stgr. S. E. Z. 1887. Aust. Parn. Suppl. iii., fig. 1. Differs from the type in the size of the ante-marginal spots, which are much larger and deeper black. The red ocelli are very large and vivid, especially in ♀. Hab., Transalai, Southern Turkestan. VI.

Group 2. Valvati Aust. Parn.

This group contains, as previously mentioned, but one species, the smallest *Parnassius* at present known.

[16. **P. simo** Gray. Hab., Ladak.]

Var., *simonius* Stgr.

The type of this species is an inhabitant of the Himalayas, and does not belong to the Palaearctic Region as defined in the present work, but its variety *simonius* is found in Turkestan.

33—46 mm.

F.w. Less rounded than in the foregoing species. Wings dull white. All the characteristic black markings are present, but there are no red spots either above or beneath. Ante-marginal band well marked on f.w. and h.w. Antennae black with club much elongated. It is of very insignificant appearance as regards both size and colour, compared with the other species of the genus. I believe it is rare in collections. My single specimen was received from Dr. Staudinger. I have not seen the ♀, but reproduce Austat's figure of the abdominal pouch (*ante* p. 171).

Hab. South of Issyk-Kul, Cent. As. VII., at very great elevations, "4,000 to 5,000 m." R.H.

I have described this species from the specimen in my collection, but Austat figures it as having a slight tinge of red on the ocelli in the h.w. of ♂, and beneath in that sex two red inner marginal spots.

(To be continued.)

Aberdeen Flowers in December.—On account of the abnormal nature of the past year, many peculiar features have been observed among our wild plants. The weather was very mild in early spring. Then we had the severest snowstorm towards the end of March which had occurred for many years, and April as well as May were throughout unpropitious months. A good deal of annoyance was caused to vegetation, resulting in various peculiarities among plants. This doubtless accounts for more specimens being seen in flower at present than is usual in the month of December. I notice blooms of small spear-wort (*Ranunculus flammula*), and creeping crowfoot (*R. repens*). Some on twigs of common broom (*Spartium scoparium*), also of the common daisy (*Bellis perennis*) and scentless feverfew (*Pyrethrum inodorum*). I see specimens are in flower of cross-leaved heath (*Erica tetralix*), the fine-leaved heath (*Erica cinerea*), and common ling or dog-heather (*Calluna vulgaris*). Creeping water-scorpion grass or forget-me-not (*Myosotis repens*), and specimens of small bugloss (*Lycopsis arvensis*) are blooming. I may mention one feature on the opposite side. In the case of red whortleberry, locally known as cranberry (*Vaccinium vitis-idaea*) I have not seen any flowers at present. Thus the one which usually flowers, does not appear to have done so, while those named do not as a rule present specimens in flower at this date and mark some features peculiar.—*W. Wilson, Alford, Aberdeen, N.B., 6th December.*

AN INTRODUCTION TO BRITISH SPIDERS.

By Frank Percy Smith.

(Continued from page 195.)

BEFORE proceeding with a systematic list of British spiders, it will be as well to give a few notes on the classification adopted.

The Order Araneidea, or true spiders, is divided into a number of groups, called families. Different writers have formed various groups of this character, but these, being founded chiefly on the position of the eyes, are not so much at variance as one might expect. The tendency of modern research seems to be to increase the number of these families, aberrant

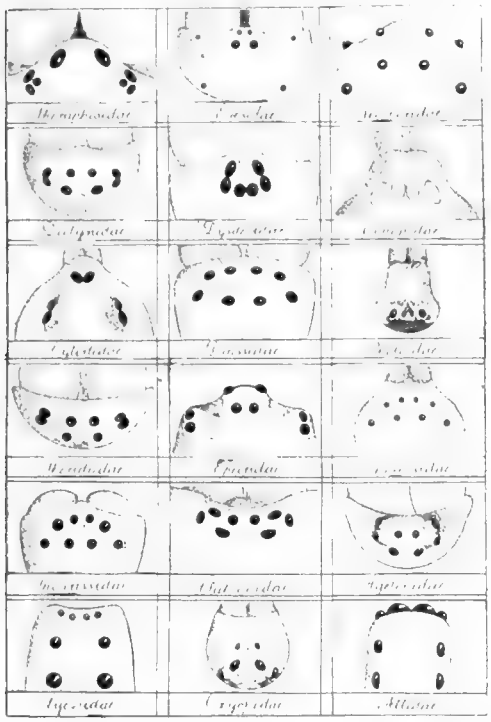


Fig. III. British Spiders.
Typical arrangement of eyes in families.

forms being removed from the position originally assigned to them, and new families formed for their reception.

The families are further sub-divided into genera, and here very obvious difficulties arise. There are many differences which may be regarded as generic characters, and the trouble seems to be that of determining which of these is of the greatest importance. The position of the eyes is usually very typical, but, in the most intricate family, namely Theridiidae, the caput of the male is often of a most extraordinary form, while that of the female is of the normal shape. The relative length of the legs, and the form of the maxillae and labium are usually regarded as important generic indications, but many other differences are often taken into account.

The most reliable specific characters in the male are the palpal organs, the cubital and radial joints of the palpi, with their apophyses when present, and in some cases the size of the eyes, the height of the clypeus, and the form of the falces. The vulva of the female is a very good specific character, as is often the case with the falces and their denticulations.

With regard to the family Theridiidae, the formation of genera is a matter of great difficulty, owing to the similarity existing between the numerous species. As the matter now stands, it is more or less a choice between the few genera of Blackwall, and the multitude adopted by Continental arachnologists. I shall not, in this list, retain any of Blackwall's genera, as has been done by the Rev. O. P. Cambridge in "The Spiders of Dorset," although these are better known here. It is my opinion that by complicating this family with genera based on microscopic details, one puts a very considerable difficulty in the way of

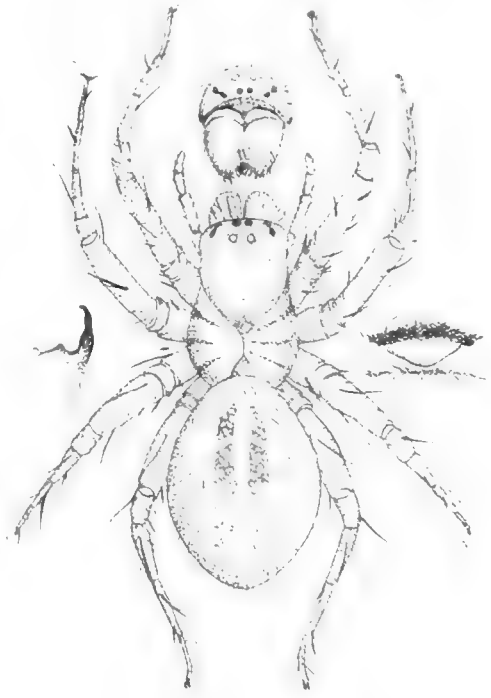


Fig. IV. *Amaurobius similis*.
Female eyes in front. Radial apophyses. Vulva.

beginners. We must not lose sight of the fact that species, after all, are the only real existing things, and that genera are an arbitrary arrangement for convenience in classification. What seems to be most needed in the study of the Araneidea is a complete series of accurate drawings of the more important

specific characters. Such drawings should include the palpus of the male with its appendages, the vulva of the female, and the eyes and falces viewed from in front.

I should strongly advise students of this Order to obtain a copy of "The Spiders of Dorset," and, if possible, Blackwall's "Spiders of Great Britain and Ireland" should be consulted for the sake of the plates. These latter, although in many cases not sufficiently accurate to distinguish obscure species, are most useful in conjunction with the first named work.

It should be noted that in the following list of spiders I have given only those characteristics necessary for the identification of genera and species, and these solely so far as the British forms are concerned. When I have noted habits or localities, it is either from personal experience, or from some trustworthy authority.

The measurements given are from typical specimens, but all species are subject to more or less variation in this respect. As before mentioned, the metric system will be used, the dimensions being stated in millimetres.

In executing my drawings, the subjects have necessarily to be enlarged; but in the letterpress the average measurements are given of each species depicted.

The description of the most important parts, with regard to families, will be in accordance with and in the same order as in my introduction (*ante*, page 194).

FAMILY 1. THERAPHOSIDAE.

Most of the spiders included in this family are found in tropical countries. They are usually of large size, heavily and powerfully built, and very hairy. The colouring is never very bright, being usually brown or dark brownish-red. Many species form trap-doors at the entrance to their retreats. The form of the chief parts may be noted as follows:—CEPHALO-THORAX. This is usually broad and flattened, the front portion of caput being more or less raised. EYES. These are eight in number, and arranged on the front raised portion of the caput. An example is shown on Fig. III. One tropical genus has six eyes. LEGS. Strong and robust. FALCES. Articulated so as to be capable of movement in a vertical plane. MAXILLAE are long and the labium usually rather small. PALPI. These in the female are used as organs of locomotion. ABDOMEN. Small compared with the cephalo-thorax. The breathing organs are four in number, placed in the form of a square. The spinners are six in number (four in some exotic genera), the superior pair being turned upwards.

GENUS *ATYPUS* LATR.

Eyes eight, arranged as in Fig. III. (Theraphosidae), Falces enormously developed.

Atypus piceus Sulz. (*A. sulzeri* Latr. and Bl.).

The well-known British species (Fig. I.).

Length. Male 8.4 mm., female 13 mm.

Localities. Dorset, Hampstead Heath, Channel Isles.

Atypus blackwallii Sim.

This is a Continental species, and does not appear to be British. The specimen described in "Spiders of Dorset" is probably a malformed male of *A. piceus*.

Atypus beckii Cambr.

This is an exceedingly rare species. It may be distinguished from *A. piceus* by its somewhat larger size and by the ocular area being longer and narrower. In colouring the two species are very similar.

Length. Male about 9 mm., female about 14 mm.

Localities. Portland and Hastings.

FAMILY 2. ERESIDAE.

The spiders included in this family are found chiefly in warm countries, but the family is a small one. Only one species has been found in Britain. The form of the chief parts is as follows:—

CEPHALO-THORAX. Rather quadrate, the caput being convex and raised above the thorax. EYES. Arranged more or less as shown in Fig. III. LEGS. Strong. The metatarsi of the fourth pair are calamistrated in the female. FALCES. Rather small, capable of a horizontal movement. MAXILLAE. Rather straight, labium somewhat elongated. PALPI. Short and thick. ABDOMEN. Obtuse, more or less oviform. Ordinary spinners rather short. A supernumerary spinner is present in both sexes.

GENUS *ERESUS* WALCK.

Eyes eight. Arranged as shown in Fig. III. Legs 4, 1, 2, 3.

Eresus cinnabarinus Walck.

This spider, which is the only British representative of the family Eresidae, may be distinguished without difficulty on account of its brilliant and beautiful colouring. The abdomen is of a bright scarlet hue, with four black spots on the upper surface. These spots are of considerable size and are fringed with white hairs. Unfortunately, this species is exceedingly rare.

Length of the male 8 mm.

Localities. Dorset, Bournemouth, Channel Isles.

FAMILY 3. ULOBORIDAE.

The spiders comprised in this family are few in number, and very remarkable in both structure and habits. The snare is of a more or less perfect geometric form. The chief characteristics of the family may be noticed as follows:—

CEPHALO-THORAX. Short, oblong and depressed. EYES. The laterals of the two rows are always well separated (Fig. III.). LEGS. These are strong, and the first pair much the longest. The female has the metatarsi of the fourth pair calamistrated. FALCES. Moderately developed and capable of a horizontal motion. MAXILLAE. Strong and fairly straight; labium rather short. PALPI. Highly developed in the male. ABDOMEN. Large and projecting over the thorax. Spiracular openings two in number. A supernumerary spinning organ is present in both sexes. This family contains two British genera, easily distinguishable by the position of the eyes. It includes no common species.

ON COLOURING OF BIRDS' EGGS.

By Reginald J. Hughes.

I WAS very pleased to see Mr. Wheldon's remarks in your December issue (*ante*, p. 200) and welcome his criticisms, as it is only by threshing out difficult points, such as he raises, that we may hope to obtain any satisfactory result in this enquiry. I think, if I understand Mr. Wheldon rightly, he rather doubts that iron is actually present in the pigment of feathers or eggs, and it is evidently extremely desirable that we should have a satisfactory chemical proof of its existence. The small quantity of pigment on an egg, and its intimate admixture with the calcium carbonate of the shell, renders it difficult to discover by a chemical test whether a particular dark marking is caused by an oxide, carbonate, or chloride of iron. Yet the presence of iron in some form should be capable of proof. I think I have succeeded in demonstrating this by the following experiments.

Pour hydrochloric acid upon the brown part of any deeply marked egg, such as those of gulls, grouse, or terns. The brown pigment is at once turned to a vivid green, and a liquid of the latter colour mixes with the carbonic acid bubbles, liberated from the shell. Add a drop or two of a strong solution of potassium ferricyanide, and the green is intensified, a red or brown precipitate being very often formed, which can be increased by pouring a little more acid on to the heap of bubbles. To produce this precipitate in the greatest abundance, mix a few drops of the ferricyanide with a little of the acid, taking care that the latter is considerably in excess. Pour the mixture on an egg. Then, repeat the experiment, taking less acid in proportion, so as to produce a green, containing red or brown particles. Remove some of this coloured liquid from the egg and heat cautiously on glass by the side of a candle flame, or the egg itself can be heated, if it is thick shelled. As the liquid dries several precipitates are formed, but conspicuous among them is Prussian blue, thus the existence of iron in the pigment is fully demonstrated. The hydrochloric acid has formed protochloride of iron with the iron on the shell, and the ferricyanide of potassium has precipitated it as Prussian blue. Of the other precipitates, one is white and is probably calcium chloride formed by the action of the acid on the shell, and the other is the red or brown substance above described, which, when red, has become brown by heating. These two latter often form a crust over some of the blue, more of which can be found by scraping them away. Touch one of the brown lumps with a drop of potassium ferrocyanide, more Prussian blue is formed, and we see that it must be a per chloride of iron. It is not unlikely that a per chloride would be formed by an excess of the acid. Ferrocyanide, will not form Prussian blue with the red substance, if added before it is heated, as it immediately combines with the free acid, some of which is always unavoidably present, to form white potassium chloride; these flakes and hydrocyanic acid can easily be distinguished. The hydrochloric acid is driven off by heating.

I am inclined to think that there is some substance present in the pigment of all eggs that prevents the ferricyanide from at once combining with the green proto-chloride, but which is also vaporised when heated. This might account for the chloride being green instead of yellow brown, like most chlorides of iron. Citrates, we know, disguise the effect of ferricyanide on iron in much the same way. This can be confirmed in a somewhat curious manner by taking any coloured bivalve shell—a dark oyster, especially the inside surface, will do very well. Pour on it some hydrochloric acid, a yellow liquid will be formed. Then add a little potassium ferricyanide, a surprising amount of Prussian blue will be produced. Evidently the liquid is a perchloride of iron, and the pigment of these molluscs' shells contains iron. I believe, from observing the effects produced, that the colouring matter is pure or nearly pure oxide of iron. If another mollusc's shell is taken and ferricyanide used instead of ferrocyanide, a green liquid precisely similar to that produced on eggs, is formed, and by carefully arranging the proportion of acid we can obtain the brown precipitate as before. The blue can be shown to be Prussian blue, both in the case of eggs and mollusc shells, by adding potash, or a solution of ammonia. The former destroys the colour and the latter turns it purple, as is the case with ordinary Prussian blue. Having shown the presence of iron in the dark pigment on an egg, I think it will be readily admitted that it is most likely to be in the form of a carbonate or an oxide, on, at any rate, the eggs of all but sea-birds. Both these substances form chloride of iron with hydrochloric acid. The fact that when some of the pigment is extracted from even the most intensely coloured eggs of Class 1, as described in my previous article, it never shows the least sign of being attracted by a magnet, unless heated, is strong evidence that in this case it is carbonate of iron, and not oxide. I have not succeeded in extracting any colouring matter, in its natural condition, from eggs of Class 5, so I have not been able to test if it is capable of attraction.

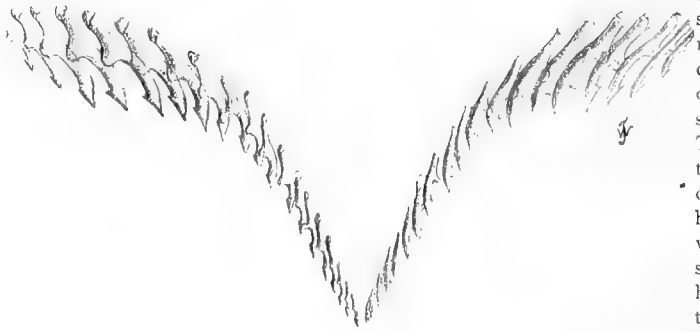
I think the fact that birds fed with carbonate of iron have the colour of their plumage intensified, instead of altered, is explained on the supposition that the different colours of, for instance, a fowl are all formed by pigments containing iron in some form, not necessarily always the carbonate. There is nothing unlikely in this supposition, as iron is known to exist in various hues. I have found the colour of molluscs' shells, whether black, orange, red, or blue, as in mussels, caused by it. Carbonate of iron furnishes the bird with an increased supply of this element to aid in the formation of the different pigments, and so they are all intensified. I do not say, however, that the colours of all birds are caused by iron, and I will refer to this again.

(To be continued.)

MONOGRAPH OF BRITISH LAND SHELLS.

A LITTLE more than five years ago Mr. J. W. Taylor issued the first carefully executed part of his monograph on our non-marine molluscs.(1) Since that time others have appeared at increasing intervals, until half way through last November the subscribers received the fifth instalment, some nineteen months after its predecessor. Labours of love have a tendency to claim a "sweetness long drawn out," a fact which in the present instance, amateurs of the mollusca must unanimously regret. One fancies too, that there are some who are sorry that the first volume has not been as it was hoped "easily completed in four parts," and that the fifth one still leaves it unfinished. It is easy to imagine the shell collector, the student of distribution, and the stickler for priority, who would be made better naturalists by a little anatomical knowledge, saying that they were being given too large a dose, or that much of this information might have found a place under ordinal, generic, and possibly specific headings. Other more biological readers would probably echo the latter sentiment and might expect to see Mr. Taylor's time devoted to the systematic portion of the work. They would no doubt be prepared to forego some of the author's own finely made drawings, and many of his clear interpretations of anatomists' figures, which they are already familiar with, or have at their elbow, in favour of more representations of the animals themselves, their habits, and surroundings. As, however, the monograph is not intended for any one class of students, and as pure conchology has hitherto reigned supreme in our books on land and freshwater shells, from an unbiassed point of view, it must be allowed that Mr. Taylor is not only courageous, but really in the right. If the various species be treated in the same thorough way as the anatomy, the pages devoted to the latter will by no means seem out of proportion ; but one must be not accused of levity for pointing out that unless the parts be made larger or issued more often, and unless Mr. Taylor avails himself of material assistance in his gigantic task, the present generation will not be able to make full use of the book.

To turn however to the sixty-four pages which have been recently issued, it is found that the account of the radula which had just been started in Part IV., is continued and finished with considerable completeness. Methods of extraction, staining and mounting of this characteristic organ are described. Mr. Taylor chooses the word odontophore for his own use, which is a pity, seeing that it has been used to denote the muscle which supports, and brings into action the radula. A classification is tentatively made by Mr. Taylor of the radulae of pulmonates. These are divided into those with narrow basal plates to the "teeth" (Stenodontophora), and those in which these are broad (Eurydontophora). Three sub-headings are given of the first; forms with "sickle-shaped," or as Mr. Taylor calls them, "prickle-shaped 'teeth,'" are not represented among our land and freshwater snails; "arrow-shaped," or as one would preferably call them "fish hook-like 'teeth,'" only occur among our worm-eating slugs (Testacellae) and by the courtesy of the author his figure illustrating these is reproduced. The drawing is evidently from the specimen previously mentioned in a paper by Mr. Taylor (Journal of Conchology, 1888, p. 341), and the number of teeth



TEETH FROM THE RADULA OF *Testacella haliotidea*.

on the radula is the same, 38 rows of 36 denticles. It should however be pointed out that the number of rows and teeth in the row is variable, the present writer having counted 54 × 38, 52 × 36, 52 × 34 and 40 × 34. After this, one has to jump to *Physa* to find a hedgehog-like radula, and the suggestion that it is not nearly related to the other "narrow" forms of teeth is emphasised by the angle, which the two halves of the row of these structures make with one another pointing to the mouth opening, instead of to the gullet, as in *Testacella*.

There are four divisions suggested of the forms of teeth with broad basal plates characterised (1) by their being crowded together in enormous numbers as in most Helices; (2) by the presence of bifid median denticles as in *Planorbis corneus*; (3) by a slender trifid median tooth, while the others are of a practically uniform and usually simple hooked character, *e.g.*, *Punctum pygmaeum*; (4) by a tricuspid median tooth and laterals of various shapes, with marginals approaching the carnivorous types first considered, *Vitrea* and *Limax* are examples. The classification of forms where the nerve cords are not twisted as far as names go will stand thus:—

EUTHEYNURA.

STENODONTOPHORA.—(1) Acanthoglossa; (2) Beloglossa; (3) Echinoglossa.

EURYDONTOPHORA.—(1) Pvcnoglossa; (2) Zeugoglossa; (3) Myriaglossa; (4) Dichoglossa.

Sections are also made according to the number of tracts in the alimentary canal, which is considered and illustrated in detail. The circulatory and glandular systems also come in for attention, but the pages which give a special interest to Part V. deal with food, and some habits aptly discussed in their several connections.

Much interesting matter is given with regard to the effect that age, exercise, and temperature have upon the

FIG. 2. TEETH FROM THE RADULA OF *Physa fontinalis*.

pulsation of the heart. Here aestivation in the warm weather and hibernation in the cold, are naturally discussed. Winter shelters, supposed to have been excavated in limestone by *Helix aspersa*, are described and figured. Want of space, unfortunately, does not allow of the illustrations being reproduced here. For the burrow, Mr. Taylor uses the name "hybernaculum," a term usually employed for the thick epiphragm, with which the shell of many species is closed in winter. Passing on, the homing instinct of molluscs is dealt with, and the trouble taken by indi-

FIG. 3.—*Arion hortensis* AND *A. subfuscus* REASCENDING BY MEANS OF SLIME THREADS.

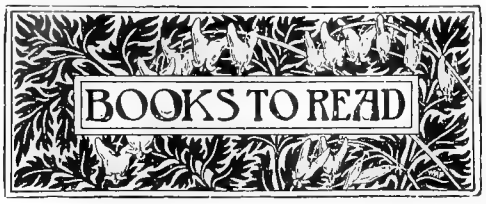
viduals to return to their quarters, after a difficult journey in search of provender. As in the limpet, the track followed often crosses itself, forming a figure of eight, and Mr. Taylor, judging from the trails of Limaces, assumes that such is the case with other species.

From trails of mucus one is led on to slime glands, and threads of slime used by naked forms particularly, to let themselves down from trees to the ground or to find fresh supplies of food. The thread may reach a dozen feet in length in the slugs, and a very pretty illustration from sketches by Mr. Wallis Kew of one of these animals descending and another climbing up a slime-thread is given above. Freshwater forms, we are told, are, however, the greatest adepts at this mode of travelling.

WILFRED MARK WEBB.

2, *The Broadway*,
Hammersmith, *W.*

(1) "Monograph of Land and Freshwater Mollusca," by J. W. Taylor, F. L. S.



NOTICES BY JOHN T. CARRINGTON.

Our Rarer British Breeding Birds. By RICHARD KEARTON, F.Z.S., xvi. + 149 pp., 9½in. × 6in., with 70 illustrations from photographs by C. Kearton. (London, Paris, New York, and Melbourne: Cassell and Co., Ltd., 1899.) 7s. 6d.

As a work of art and of accurate popular interest, it would be difficult to choose a more beautiful Christmas present than this last book of the brothers Kearton. Both Richard and Cherry Kearton are skilled and practical ornithologists, with an exceptional knowledge of the habits and nesting places of British birds. Consequently, we have a pleasure beyond the great artistic merit of the illustrations, in the fact of knowing what appears in the brightly-written letterpress, will be truthful and trustworthy. In the work before us, the haunts of the rarer birds that breed in Britain, are depicted with their nesting places. The birds now described are not included in the former works of these gentlemen, who are to be congratulated on having obtained photographs of so many rarities. To attain this, much anxiety, travel, and good judgment must have been expended; for it seldom falls to the lot of one man to see nests of all the birds herein pictured. Rich as is the result, there are still some birds breeding in this country to be photographed, and the author appeals for opportunities to enable his brother to depict them in their homes. An important new feature in this book, that has not appeared in others by Mr. Kearton, is the indication of the scale of the pictures, which renders them much more valuable. With regard to the illustrations, those who know the former works of the Kearton, will appreciate what is meant, when we say those before us are even better than in their former books. The frontispiece representing an osprey and nest, is a remarkable picture. By the courtesy of the publishers, we reproduce the photograph of a nesting place of the long-eared owl, which is so characteristic of the type of woods where we, ourselves, have found it, that the view especially appeals to us, as doubtless it will to many of our readers.

Origin of the British Flora. By CLEMENT REID, F.R.S., F.L.S., F.G.S., vii. + 191 pp., 9in. × 6in. (London: Dulau and Co., 1899.)

The author's association with the geological survey of England and Wales, has afforded him many unusual opportunities for comparing the fossil flora with the recent flora of the British Islands. In the introduction, Mr. Clement Reid tells us that he first developed an interest in the difference between the Newer Tertiary and existing floras, while conducting the geological survey of East Norfolk and its Preglacial forest-beds off Cromer. This led him to a study of our recent flora, especially with regard to the fruit of those natural orders which were represented in a fossiliferous state. In the book before us we have the results of more than twenty years' work in this direction; which, from the scientific point of view, are most valuable as indicating the age of our flora. The work, therefore, will be found a necessary addition to the library of every botanist worthy of the name. It must be remembered that in dealing with the origin of the British flora, it commences with records that have been awaiting in a fossil, or sub-fossil, condition, for many thousands of years, thus affording evidence that many of our familiar wild plants can show an ancestry far more ancient than that of mankind.

Who's Who—1900. xviii. + 1,092 pp. 7½in. × 5in. (London: Adam and Charles Black, 1900.) 3s. 6d.

This is the fifty-second year of issue of this, the most useful, annual biographical dictionary of living persons. It is much enlarged, and contains additional biographies and other information. It is brought up to the 31st October, therefore it is the most recent of its kind. Preceding the biographies are 110 pages of useful information; and as a whole, it is difficult to imagine a book of reference containing so much, within the limits of its covers.

Optics. A Manual for Students. By A. S. PERCIVAL, M.A., M.B. xii. + 399 pp., 8 × 5½, with diagrams. (London: Macmillan and Co., 1899.) 10s. net.

The author of this book states in his preface that it is designed primarily for the use of ophthalmic students, and such being the case one would expect that details closely pertaining to the human eye occupied by far the greater portion of the book. As a matter of fact, however, the reader is not brought to this section before p. 328 is reached. The first 327 pages are taken up with a very full and masterly treatment of more or less general physical and geometrical optics, which to one who has already had a good grounding in the subject and knows a fair amount of mathematics, will prove very useful reading. Indeed, this part of the book is perhaps better adapted to the wants of a student reading physics and mixed mathematics for his B.Sc. examination, than to an ophthalmic student, the mathematics in some places being out of the reach of the latter. He will, however, find very important and useful information from page 328 onwards. The book is well written and the large number of diagrammatic illustrations given considerably simplify the work and assist the reader.—*J. Q.*

Handbook of Optics for Students of Ophthalmology. By W. N. SUTER, B.A., M.D. viii. + 209 pp. 7½in. × 5in., with diagrams. (New York and London: The Macmillan Company, 1899.) 5s.

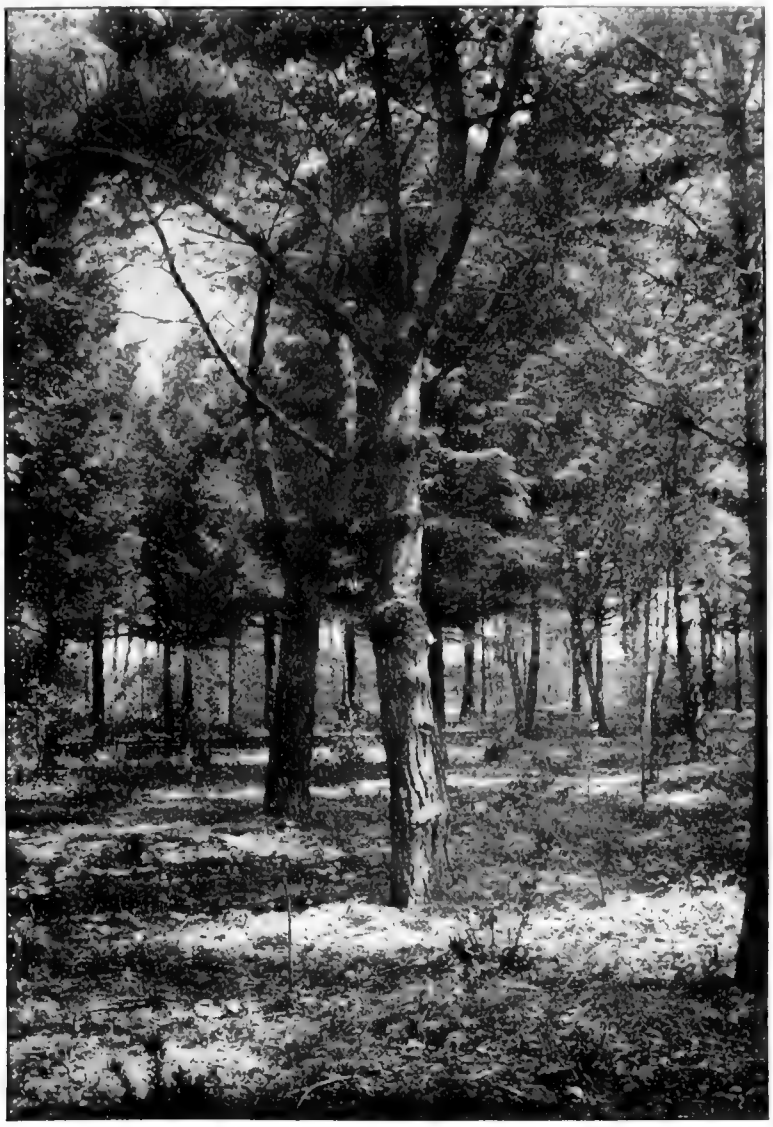
This book should form a very useful guide to the ophthalmic student, for whom it is specially written. Just sufficient of the general principles of refraction and dispersion of light are given to enable the reader to follow the matter relating directly to the eye. In fact, the author has succeeded in embodying many ophthalmic demonstrations, while explaining general optical phenomena. Examples that the student meets with daily are completely worked out in the text. To appreciate the books one requires a good grounding in geometry, some algebra and the principles of plane trigonometry, but not more. For the benefit of those unacquainted with the last of these, a very brief explanation of trigonometrical terms is given at the end of the book. Perhaps on the score of the mathematics required, the book will find more favour with the medical reader.—*J. Q.*

Rise and Development of the Liquefaction of Gases. By W. L. HARDIN, Ph.D. x. + 247 pp., 7½in. × 5in., with 42 illustrations. (New York and London: Macmillans, 1899.) 6s.

If a curve were plotted having as its ordinates the successes in the realm of the liquefaction of gases, and as its abscissal the years of the present century, it would

show an almost continual rise until within the last ten or twenty years, when it would ascend much more abruptly. It is within this last period that the most extensive and important work has been done, for starting in 1877 with Cailletet's successes in liquefying

ing manner. He divides the book into four chapters, the first being more or less introductory to the subject. The second deals with the earlier attempts at liquefaction. It is in this period that the names of Thilorier and Natterer are brought forward, and their



Long-Eared Owl's Nest.
(Kearton's Rarer British Breeding Birds.)

oxygen and carbon monoxide, the subject has received thorough investigation at the hands of such men as Pictet, Wroblewski, Olskewski, Dewar, Linde, Hampson and others. The various reports and communications relating to the work, however, have been more or less scattered amongst the world's literature, and the author of the present book has done good service in bringing them together in such an interest-

work adequately discussed. Chapter three contains a detailed account of Andrews' well-known experiments, and is therefore an important one, for, as the author states, with the observations of Andrews a new era begins. The difficult question as to the conditions of gases at their critical points are here discussed: the views of various experimenters being put forward. —*J. Q.*

GEOLOGY

CONDUCTED BY EDWARD A. MARTIN, F.G.S.

SCARCITY OF TERRESTRIAL REMAINS.—A little thought will enable the enquiring geologist to realise how slight are the chances of terrestrial animals leaving their hard parts in a fossilised condition in water-formed strata. When a land-living organism dies, its body rapidly decomposes, its bony portions finally obeying the same law. Unless covered up by strata, comparatively few of such remains reach an area where sedimentary formations are being laid down. Some may fall into the bed of a running river, and may be there entombed, or be transported to the sea to be there preserved. Other remains become buried in chemically-formed deposits, such as deposits of travertine or in stalagmite. Other creatures lose their lives in peat-bogs, and so become preserved. The action of the wind in forming sand-dunes may sometimes be responsible for the covering of remains, although it is not possible to determine with certainty any ancient rocks whose origin can be attributed to aeolian action. Landslips may have also been responsible in times past for the preservation of forms of terrestrial life, whilst occasionally the dust and ashes of volcanoes are known to have entombed such remains. But putting all these possible causes together, their results are insignificant as compared with those resulting from the many opportunities to be found in every stream, river, sea, and ocean, for the entombment of marine creatures in the sedimentary deposits there forming. Mere absence of certain forms of terrestrial life in a deposit, is, therefore, no evidence that those forms did not exist. The real cause for wonder is that the geological record is as perfect as it is.

CALCITE AND ARAGONITE.—The extent to which shells of molluscs formed of carbonate of lime resist the tendency to disappear under the solvent agency of water charged with carbonic acid, depends not only upon the time during which they are exposed to such action, but also on the form in which the carbonate of lime exists. If the shell be of aragonite, this will be found to have disappeared in strata where shells composed of calcite often remain intact. Aragonite is harder and heavier (sp. gr., 2.93) than calcite (sp. gr., 2.77). *Pectunculus glycimeris* is an example of an aragonite shell, such shells being opaque, having a chalky appearance and a compact structure. Among calcite shells is the fossil *Pecten opercularis*, which is translucent, and its surface is compact, but its interior is porous. All the Brachiopoda and the Echinodermata have calcite skeletons, as well as *Ostrea* and *Pecten* amongst the Lammellibranchs; but the common mussel (*Mytilus edulis*), *Pinna* and *Spondylus* have an inner layer of aragonite, and an outer one of calcite.

THE GREAT CROSBY BOULDER.—In the transactions of the Liverpool Geological Society, 1898-1899, is a description of the erection in the village of Great Crosby of the great Gypsum Boulder, by T. Mellard Reade, F.G.S. This mass of gypsum is estimated to weigh 18 tons, and to contain 280 cubic feet. It was discovered in 1898 in the brickyard of Mr. E. Peters, in Cook's Lane, Great Crosby. The offer of the proprietor to present it to the local District Council was accepted, with the result that it has now been erected in the village on a suitable pedestal, and has been carefully oriented so as to correspond with its original position where found. Mr. Reade is to be congratulated on the successful completion of the work.

CHALK OF HAREFIELD.—Harefield is noted for its cement works, where there is a good section of Upper Chalk, overlaid by London Clay and Woolwich Beds. The chalk exposed is about sixty feet thick, with marked layers of flints almost continuous every four feet. Fossils are not easy to find, but I have been able to procure *Caryophyllia cylindracea*, *Porosphaera*, *Terebella lewesiensis*, *Onychocella lamarcki*, *Membranipora*, *Dianchora*, *Pecten cretosus*, *P. nitidus*, *Ostrea acutirostris*, *Bourgueticrinus*, spines of *Cidaris perornata*, *C. sceptrifera*, *Micraster coranguinum*, *Pollicipes glaber*, and *Ananchytes ovatus*.—*G. Fletcher Brown, 3, Topsfield Parade, Crouch End, N.*

NOBLE OPAL IN SOMERSET.—There can be no doubt that the whole of Somerset is strongly glaciated, the evidence being naturally plainer in the hilly parts. I detected a good example of glacial drift, amongst many such cases, on the shore between Kiloe and Watchet. Below the red beds of the Keuper on the shore there is a vast accumulation of red pebbles of the same colour as the Keuper hard beds but I found on a careful examination they are without a doubt of Devonian origin. I followed them in their course down the long slope from the Quantoch range, finding them visibly scratched and relatively unworn, and on the main road to Watchet the source of the supply was discovered, the hard Devonian slates. Near Radstock an opal pebble occurred in the drift. I have discovered the origin of these "noble opal" pebbles. They occur sparingly in the lower beds of the Inferior Oolite, which contain concretionary masses and derived materials. They are in fact conglomerative, although not of a strongly accented type. The source of supply is therefore near. This does not detract from its glacial origin, of which there is abundant proof in scratched blocks, etc., some of them probably of millstone grit age. These must have been transported for at least a distance of five miles. The course of the local drift seems to have been largely from the chalk range of Wiltshire, which lacks a name, as an increase of flint *débris* can be noted in the fields, as one approaches that range from here. As many of these flints are variously fractured, the geologist invites the archaeologist to reconsider some of his flakes in the light of glacial erosion. An archaeologist on the other side might invite his geologist brother to study the difference between the erosion of the plough and that of ice. This challenge he has begun to accept, to the large increase of accurate knowledge on both sides, and to the great profit of many hitherto dubious points in Somersetshire geology.—*T. Stock, Frome Hill, Radstock.*

GEOLOGICAL EXCHANGE MEETINGS.—Various exchanges were arranged at SCIENCE-GOSSIP offices at the meeting announced last month. The next meeting for exchanges will take place on January 10th, from 5 p.m. to 7 p.m., when readers are invited to attend with their specimens. The departmental editor will be present. Specimens may be sent to his care, and in this case it should be stated what is desired in exchange. It is hoped that as many readers as possible will attend.

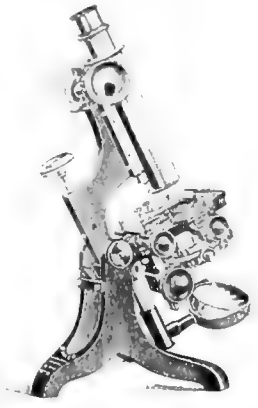
MICROSCOPY

CONDUCTED BY F. SHILLINGTON SCALES, F.R.M.S.

"SOLOID" MICROSCOPIC STAINS.—The tendency of solutions of the aniline dyes to decompose is well known, and has been a fruitful source of trouble to microscopists. Messrs. Burroughs, Welcome and Co. obviate this danger by supplying certain stains not only in a dry state, but in tabloid form, each tabloid, or, as the makers call it, "Soloid," being of known strength and requiring only to be dissolved in water or alcohol to produce a solution of equally definite concentration. The stains at present sold are *Eosin*, *Bismarck Brown*, *Fuchsine*, *Gentian Violet*, and *Methylene Blue*. Each "Soloid" contains one grain, and can be obtained from the microscopical opticians in tubes of six "Soloids" for the modest price of sixpence. We have had an opportunity of experimenting with these stains, and can recommend them to the notice of our readers. The instructions given with the stains are so clear and practical that we cannot do better than reproduce one or two examples for the benefit of microscopists. A saturated watery solution of fuchsine, methylene blue, gentian violet, or Bismarck brown is obtained by powdering one "Soloid" stain in 7 c.c. (two drachms) of distilled water, and then well shaking. Five to ten per cent. dilutions with distilled water of these saturated solutions are well adapted for ordinary staining purposes. Thus one drachm of saturated solution made up to two ounces with distilled water gives 1 in 17, or a 6 per cent. solution. A saturated alcoholic solution of methylene blue, gentian violet, or Bismarck brown may be obtained by heating in the same way one "Soloid" stain with a similar quantity of absolute alcohol instead of distilled water. A saturated alcoholic solution of fuchsine is obtained by heating two "Soloids" with 3·5 c.c. (one drachm) of absolute alcohol. A solution of eosin suitable for general staining is obtained by dissolving one "Soloid" in 12·25 c.c. (three drachms) of 50 per cent. absolute alcohol in distilled water. This gives approximately a 0·5 per cent. solution. Löffler's alkaline methylene blue, aniline gentian violet, etc., can be readily made as wanted in the same simple and systematic way.

TO STAIN THE TUBERCLE BACILLUS.—Transfer a small quantity of sputum, containing, if possible, one or more of the small yellowish masses, to a glass slide: cover this with a second slide and rub the two together until the sputum is thoroughly broken up and mixed. Draw one side of a clean cover slip across one of the slides so as to cause a thin film to adhere to it; allow it to dry in the air, and fix by passing, with the film upwards, three times through the flame of a spirit lamp or Bunsen burner. Now place the cover slip film upwards, and with an edge projecting, on the end of a strip of metal about half-an-inch wide and eight to ten inches long, and carefully drop the carbol fuchsine solution upon the film so as to cover it without running over on to the metal. Place the metal in the flame at such a distance from the cover slip that the stain just steams gently; carefully avoid boiling, and after two minutes remove the slip with forceps. Drain off the surplus stain on to blotting paper, wash well under a tap or in a large beaker of water and place for 10 seconds in 25 per cent. hydrochloric acid. Wash well in methylated alcohol until no more red colour comes away: rinse in water, and, still holding the cover slip with the forceps, drop a watery solution of methylene blue upon the film and allow it to stain for thirty seconds. Drain off the stain, wash rapidly in water; press gently between folds of blotting paper, and allow it to dry in the warm air above the flame at such a height that the hand can be easily held there. Mount in xylol balsam. Tubercle bacilli will be stained red by the fuchsine; all other organisms will be coloured blue. A very convenient and useful method for the preliminary staining and examination of any smear preparation, is to mount it, when fixed, in a drop of Löffler's methylene blue and remove all surplus stain by gently pressing a piece of blotting paper upon the specimen. Microbes, cell nuclei, etc., take up the dye very readily, and show up well although mounted in the dye itself, which in such a thin film appears almost white by contrast.

BAKER'S NO. 1 "D.P.H." MICROSCOPE.—In a recent note on the Malaria parasite, we gave a description of the small travelling microscope which Mr. Chas. Baker originally made for Major Ross, and with which the latter carried out his investigations. By the courtesy of the same maker, we are now able to illustrate one of twelve microscopes supplied by him to the London School of Tropical Medicine, which instrument has recently been submitted to us for inspection. The illustration explains itself, but we may call attention to the fact that in this model Mr. Baker has adopted the lever form of fine adjustment, which, originally so adversely criticised, has now justified its existence as being one of the most delicate, yet steady and reliable adjustments made. The form of tripod foot is steady and gives more room than usual for the adjustment of the under stage arrangements. The microscope is fitted with the usual focussing and centering substage, swinging tail-rod for mirrors, draw-tube, etc. and with the addition of the excellent mechanical stage shown in the illustration costs £11. Without this last, but with the Nelson type of horse-shoe stage, fitted with sliding bar, the microscope costs £8 8s. This instrument can be strongly recommended both for workmanship and design, for all purposes of original research.



Mr. R. G. Mason's Catalogue.—Mr. R. G. Mason, of 69, Clapham Park Road, sends us an interesting list, which contains several novelties, amongst which we may mention a convertible lantern and table microscope. Most of the microscopes appear to be of good design, and there is a new model specially designed for the use of teachers, which is called "The Champion," concerning which we can speak favourably after a personal inspection. It is on a tripod form of foot, has diagonal rack coarse adjustment, and lever fine adjustment, draw-tube, sub-stage tube for condenser, and the usual mirrors. The workmanship is sound and the price of the stand alone is only £3 13s. 6d. We may also call attention to Mr. Mason's sets of mounted slides for students, and lantern slides for lecturers, specimens of which have been submitted to us, and which are both good and reasonable in price. Beginners will find the various series of prepared but unmounted objects excellent practice, and we note with approbation that these have been, in each case, sent out still moist from the final clearing stage—a manifest improvement on the usual dried objects sold for this purpose. Mr. Mason also sells an unostentatious, but practical, little sixpenny pamphlet on elementary mounting, which should have a good sale.

Cement for Glycerine Mounts.—In making permanent specimens of objects mounted in glycerine or Farrant's medium, considerable difficulty is experienced in cementing the cell. I have tried various methods, but the most successful in my hands has been to use a thick solution of gum dammar in benzole. Select a clean sample of the gum and dissolve in benzole until the required consistency is reached. The edge of the cover glass is then freed from superfluous mountant, and the cement laid on in the usual way. The first layer will in a few hours be sufficiently set for the application of a second, which is generally necessary.—*Frederick Noad Clark, Paddington Infirmary, London, W.*

ANSWERS TO CORRESPONDENTS.

Mounting Algae. W. H. B. (Folkestone).—You have, unfortunately, made your first attempt on a difficult subject. I would suggest boiling some water for ten minutes to get rid of the air in it, and in this gently heating or even boiling the specimen itself, for other ten or fifteen minutes, and finally putting the latter under the air pump in a small quantity of the same water. Before mounting in glycerine jelly, soak in a mixture of glycerine and water, and examine under a dissecting lens. If any air-bubbles should still remain in the cells they must be removed carefully one by one with a fine needle. It was useless putting the slide under the air-pump when mounted—glycerine jelly sets and cools too quickly, and is besides too dense to displace the air in the cells. The object needs the above careful preparation beforehand. Glycerine jelly is always more troublesome than Canada balsam with respect to air bubbles, but is otherwise very suitable for botanical mounting. There is no book which will enable you to identify algae off-hand, without a preliminary study of the subject, but I would suggest your obtaining "Gray's British Seaweeds" (10s. 6d.), or Harvey's "Manual of British Marine Algae" (21s.). The authoritative book on Marine Algae is Harvey's "Phycologia Britannica," but it is very costly (£7 10s). M. C. Cooke's "British Freshwater Algae" (£4 10s.) is the best book on the sister subject.

MICROSCOPY FOR BEGINNERS.

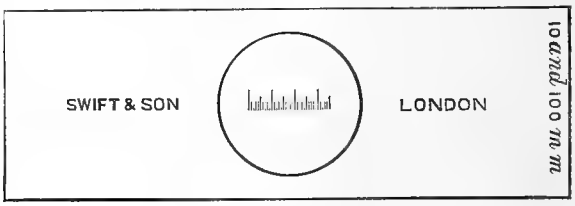
By F. Shillington Scales, F.R.M.S.

(Continued from page 215.)

Into the multitude of accessories figured and described in microscope-makers' catalogues we cannot of course enter in these papers. One or two items, however, are sooner or later necessary. For instance, some method of measuring objects will be required, and the simplest means of doing this is to become possessed of a stage micrometer, which is a slide

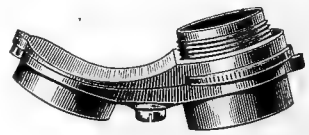
Stage Micrometer.

3in. by 1in., ruled in $\frac{1}{100}$ths and $\frac{1}{1000}$ths of an inch, or $\frac{1}{10}$ths and $\frac{1}{100}$ths of a millimetre, and costing 5s. A small disc drops into the Huygenian eyepiece, and lies on the diaphragm. This is called the eyepiece micrometer, and it is also ruled with divisions that



Eye-piece Micrometer.

generally bear some relation to an inch or millimetre scale. This also costs 5s. To make measurements it is only necessary to note the number of arbitrary divisions in the eyepiece micrometer corresponding with the object to be measured, and then to replace this object on the stage by the stage micrometer, and



Nose Piece.

note the exact measurements which correspond to those taken in the eyepiece. There are other forms of micrometer, but the above is simple and inexpensive, and quite satisfactory for most purposes. A nosepiece is a great convenience, but scarcely a necessity. One or two opticians have latterly so arranged their objectives that they are all nearly in focus when rotated on the nose-piece. Under any circumstances, however, we do not recommend the use of a *triple* nosepiece, to say nothing of a quadruple one, as the weight of three objectives is quite sufficient to put a severe strain upon the fine adjustment. The cost of a double nosepiece varies from 10s. 6d. upwards.

It is quite practicable to make good drawings direct from the microscope when used in the ordinary way, the paper being placed as near the stand as possible, but for accurate work, some form of camera-lucida is necessary.

"Any one study of whatever kind exclusively pursued, deadens in the mind the interest, nay, the perception, of any others. *John Henry Newman.*

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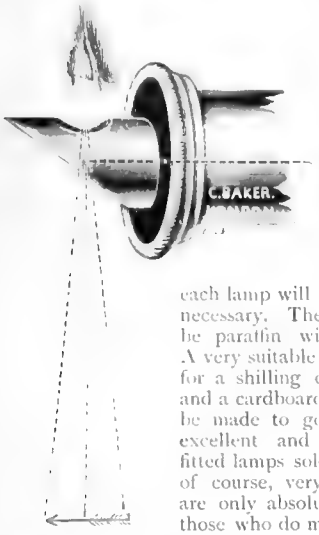
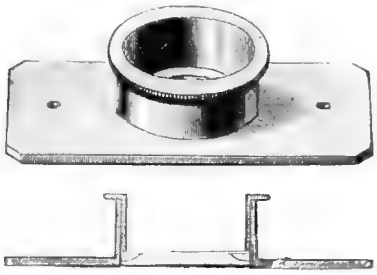
CONTENTS.

The cheapest nosepiece and perhaps the easiest to use, is the one known as "Beale's Neutral Tint Reflector," costing 5s. or 6s. It is simply a disc of tinted glass placed above the eyepiece and at an angle of 45° to the optic axis. To use it, however, the microscope should be placed in the horizontal position, which is not always possible. The eye is placed above the disc of glass, and looking down *through* it on the drawing paper placed immediately beneath. The microscopical image can then be readily traced. Some little practice is of course required, but the whole secret of success lies in arranging the illumination satisfactorily, and this is more easily arrived at, if two lamps are used, one for the microscope as usual, and one to illuminate the paper. A little adjustment of the light in each lamp will then be all that is necessary. The lamp itself should be paraffin with a ½in. wick. A very suitable one can be bought for a shilling or two anywhere, and a cardboard screen can easily be made to go round it. The excellent and often elaborately fitted lamps sold by opticians are, of course, very convenient, but are only absolutely necessary for those who do much work. Their great convenience is in the readiness with which they may be raised or lowered, and the flat receptacle for the oil, that enables them to be brought close to the table. If a regular microscope lamp be bought it should certainly be of this form, and capable of rotation, so as to enable either the flat or the edge of the flame to be used, and it should have an iron chimney holding an ordinary 3in. by 1in. glass slide, to be readily and cheaply changed if



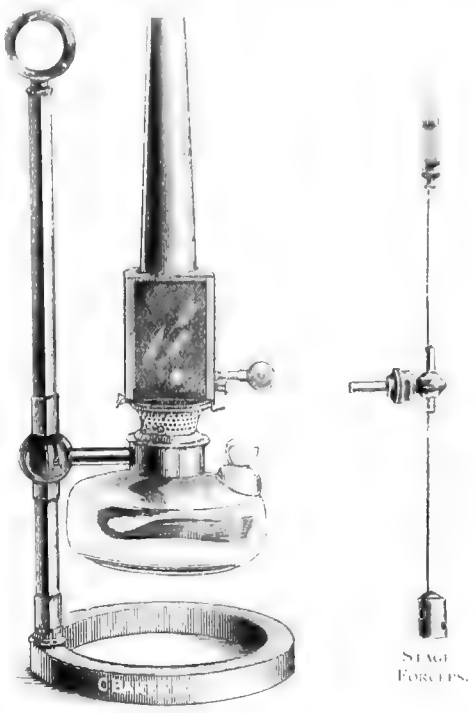
Beale's Neutral Tint Reflector.



Live Box.

cracked. Such a lamp would cost about 25s. A reflector is worse than useless, as it confuses the light rays.

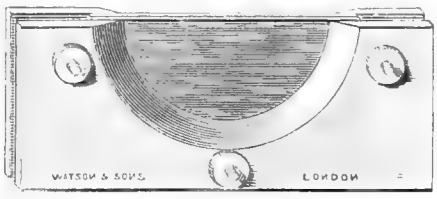
Some form of compressor, costing from 5s. to a guinea (see Science-Gossip, Vol. VI., p. 29); a live box, price 2s. 6d. or 5s.; a pair of stage forceps, price about 5s., and one or two inexpensive glass stage troughs, such as Botterill's trough, complete our list of apparatus; and with an outfit such as we have now described at length, the beginner may work for some time and need nothing more. There are, of course, several minor things that are useful or even necessary to the working microscopist, but they scarcely come under the heading of microscope apparatus. Amongst these may be mentioned brass or steel forceps, needles, ordinary needles inserted in a penholder and bound round with wax thread do excellently, camel-hair



Microscope Lamp.

Stage Forceps.

brushes, bent or straight scissors, scalpels for dissecting, dipping-tubes and other collecting apparatus, killing-bottle, etc. The uses of these things are manifest, but do not need enlarging upon here. It may be useful, however, if we give a description of



Botterill's Trough.

an inexpensive dissecting microscope that can be made at home for a few shillings, after which we shall add some practical hints as to the best way to use the microscope, its elementary management and care. We shall then conclude these papers with a few plain and easily understood instructions on mounting.

(To be continued.)

CONDUCTED BY F. C. DENNETT.

	1900 Jan.	Rises. h.m.	Sets. h.m.	Position at Noon. R.A. h.m.	Dec. ° ′
Sun	2	8.7 a.m.	4.1 p.m.	18.51	22.56 S.
	12	8.3	4.13	19.35	21.40
	22	7.54	4.30	20.17	19.43

	Jan.	Rises h.m.	Souths h.m.	Sets h.m.	Age at Noon. d. h. m.
Moon	2	8.32 a.m.	0.58 p.m.	5.33 p.m.	0 22 8
	12	1.20 p.m.	9.46 p.m.	5.17 a.m.	10 22 8
	22	0.3 p.m.	5.14 a.m.	9.47 a.m.	20 22 8

	Jan.	Souths h.m.	Semi-Diameter	Position at Noon. R.A. h.m.	Dec. ° ′
Mercury	2	10.34 a.m.	2.9″	17.21	22.14 S.
	12	10.55	2.6″	18.22	23.45
	22	11.22	2.4″	19.28	23.21
Venus	2	1.58 p.m.	5.8″	20.45	19.51 S.
	12	2.8	5.9″	21.34	16.13
	22	2.17	6.2″	22.22	11.51
Mars	12	0.13 p.m.	2.0″	19.39	22.30 S.
Jupiter	12	8.40 a.m.	15.2″	16.6	20.1 S.
Saturn	12	10.29 a.m.	7.0″	17.56	22.27 S.
Uranus	12	9.11 a.m.	1.7″	16.37	22.1 S.
Neptune	12	10.10 p.m.	1.2″	5.38	22.4 N.

MOON'S PHASES.

		h.m.			h.m.
New	Jan. 1	1.52 p.m.	1st Qr.	Jan. 8	5.40 a.m.
Full	,, 15	7.8 p.m.	3rd Qr.	,, 23	11.53 p.m.
New	,, 31	1.23 a.m.			

In perigee, January 3rd, at 5 p.m.; in apogee on 10th, at 5 p.m.; and in perigee again on 31st, at 12 p.m.

METEORS.

		h.m.		
Jan. 2-3	Quadrantids	Radiant R.A. 15.20	Dec. 52° N.	Rich.
,, 14-20	χ Cygnids	,, ,, 19.40	,, 53 N.	
,, 18-28	θ Coronids	,, ,, 15.32	,, 31 N.	

CONJUNCTIONS OF PLANETS WITH THE MOON.

			° ′	
Jan. 1	Mars†	9 p.m.	planet 3.8	S.
,, 3	Venus†	4 p.m.	,, 6.0	S.
,, 26	Jupiter†	1 p.m.	,, 2.3	N.
,, 28	Saturn*	8 a.m.	,, 0.2	S.
,, 30	Mercury*	3 p.m.	,, 5.44	S.
,, 30	Mars†	10 p.m.	,, 5.6	S.

* Daylight. † Below English horizon.

OCCULTATIONS AND NEAR APPROACH.

Jan.	Star.	Magnitude.	Disappears h.m.	Angle from Vertex. °	Reappears h.m.	Angle from Vertex. °
6..19	Piscium	5.2	7.12 p.m.	63	8.10 p.m.	182
10..19	T^2 Arietis	5.2	7.1 p.m.	49	7.59 p.m.	295
11..19	K^1 Tauri	4.6	10.27 p.m.	90	11.34 p.m.	205
11..19	K^2 Tauri	5.5	10.40 p.m.	115	11.23 p.m.	178
17..19	α Cancri	4.3	5.17 a.m.	136	5.50 a.m.	196
24..19	B.A.C. 4722	5.5	3.35 a.m.	158	4.45 a.m.	285

THE SUN still has small outbreaks at intervals. At 6 a.m. on January 2nd the earth is in the part of its orbit nearest to the sun.

MERCURY is a morning star all the month, but from its great southern declination is poorly placed for observation. At 1 a.m. on January 8th Mercury and Saturn are in conjunction, the former being 51′ to the south, but both are below the British horizon.

VENUS is an evening star all the month, daily getting into better position for observation.

MARS being in conjunction with the sun at 5 a.m. on 16th, is too close to the sun for observation.

JUPITER is a morning star all the month, but its great south declination militates against successful observation.

SATURN and URANUS are both morning stars, but not well placed for observation.

NEPTUNE is well situated near ζ Tauri.

YERKES OBSERVATORY.—Professor E. B. Frost, of this observatory, has had a grant of 500 dollars from the Rumford Committee of the American Academy of Arts towards the construction of a new spectrograph, especially designed for the determination of stellar velocities in the line of sight.

NATHANIEL E. GREEN.—Astronomy has suffered a great loss in the death of Mr. Green, a past-president and one of the founders of the British Astronomical Association. His delineations of Mars and Jupiter are some of the finest in existence. The former were made at Madeira, in 1877, with a With Newtonian, and are really faithful drawings. Mr. Green had been a Fellow of the Royal Astronomical Society since 1875.

HARVARD COLLEGE OBSERVATORY before many weeks have passed, will be furnished with a photographic telescope of 12in. aperture, and having the abnormally long focal length of 100ft. The requisite funds have been found by anonymous donors. The image of the moon, without enlargement, will be about 10in.

A NEW MINOR PLANET has been discovered photographically, by Mr. Coddington, of the Lick Observatory, and sufficient observations were made during October and November to determine its orbit.

THE NEW CENTURY will not, of course, commence until January 1st, 1901. The present new year beginning the last year of the century.

STONYHURST COLLEGE OBSERVATORY.—We have received from Father Sidgreaves the report of the meteorological and magnetical work carried on at this observatory, as well as of that of St. Ignatius College, Malta. The meteorological and astronomical work at this observatory is very well known for its high character.

A PUBLIC OBSERVATORY.—The executors of the late Canon Cross, of Appleby, having offered a valuable set of Astronomical instruments, the Lincolnshire County Committee have consented to allow an observatory to be built in the keep of old Lincoln Castle. A public subscription, it is hoped, will defray the cost of erection and maintenance. The Committee are to be asked to receive the whole in trust for the County.

"THE HEAVENS AT A GLANCE."—We have received a copy of this useful Card Calendar, for 1900, from its compiler, Mr. Arthur Mee, F.R.A.S., of Cardiff. The price is only 7d., post free. It is most handy for ready reference.

EDINBURGH CITY OBSERVATORY, under the direction of Mr. William Peck, is thrown open on certain nights in the week to visitors, and thousands have paid it a visit, both to see it arrangements and to learn something of Astronomy and its methods.

A RUSSIAN MOUNTAIN OBSERVATORY is to be erected, probably in the Crimea or Caucasus, under the auspices of the Russian Astronomical Society.

THE LUNAR ECLIPSE on December 16th and 17th, was well seen in London, happening when the moon was high in the heavens and the sky fortunately clear. The eclipse was by no means a dark one, and the strong copper colour of the shaded portion of the disc was very noticeable.

CHAPTERS FOR YOUNG ASTRONOMERS.

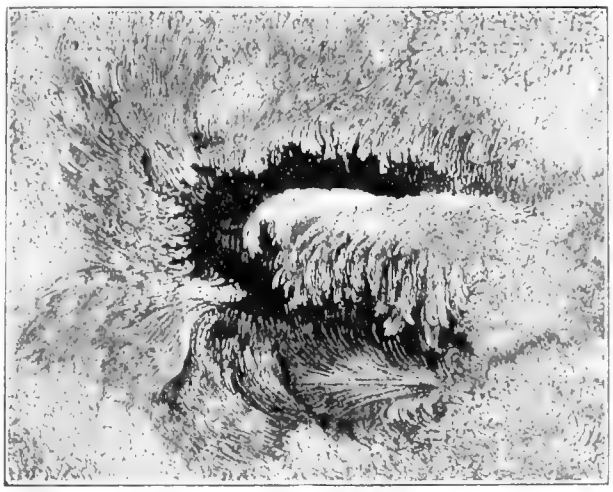
By Frank C. Dennett.

THE SUN.

(Continued from page 210).

The brightening of the inner edge of the penumbra is well shown in Professor S. P. Langley's drawing of a typical sun spot, made at the Alleghany Observatory in December, 1873, and the brilliant edgings to dark spots is very evident in the late Warren De la Rue's beautiful photograph, dated September 20th, 1861.

This necessarily leads us to the subject of the faculae or bright spots which are so often visible near the limb, but generally seem lost in the intense brilliance of the middle portions of the disc. The faculae usually appear not so much as spots, but as brilliant branching streams. They are almost always to be found around spots and groups near the limb, especially on the following, or eastward side. When found on the disc apart from dark spots, they often indicate the place where dark spots have disappeared, but this is not the unbroken rule, for the bright spots are sometimes found in northern or southern latitudes, never reached by the dark ones. They are usually more difficult objects to observe properly than are the dark spots, needing a larger telescope to show them to the best advantage. Very occasionally they may be perceived on the limb, seeming to stand out from it almost like little brilliant mountains; though it is quite possible that this may be in part due to what is known as irradiation. The writer saw an instance of this on March 5th, 1899, at 10 a.m., but by 2 p.m. the faculae had disappeared round the limb. Faculae may be readily observed whilst they remain near the limb, but as they advance on to the disc they pale, and are lost in the greater brilliance of the middle portions.



Typical Sun Spot of December, 1873.
After a Drawing by S. P. Langley.

Remarkable outbursts of brilliance occasionally reward the persistent observer, as in 1859, when, on September 1st, Messrs. R. C. Carrington and Hodgson saw a burst of "flame" over the disc exceeding the solar brilliance. Again on October 2nd, 1864, Brodie saw a very brilliant body 4″ or 5″ (from 1,800 miles to 2,250 miles) in diameter, much brighter than the rest of the disc, travel in one-third of a second along a pathway 1′, or 27,000 miles, in length, when it seemed to fall through the surface.

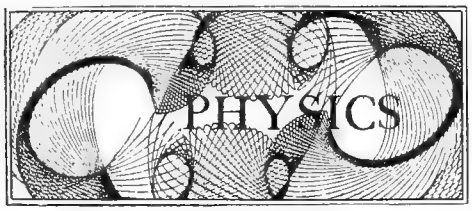
The visible surface of the sun is certainly not solid, otherwise the spots would remain stationary with relation to each other, which is contrary to observation. Likewise spots having different latitudes give different results in determining the sun's rotation period. Notwithstanding this, unless observers have been mistaken, spot groups having similar characteristics, frequently reappear on the same spot where a predecessor has disappeared. This seems to indicate that there must be a solid or semi-solid body beneath the surface of the photosphere, as the light-supplying surface is called.

From time to time when very large spots or groups appear, or disappear, round the limb, or cross the central meridian, more especially if considerable change is going on in the spots at the time; the earth's magnetism becomes much affected, and we have what is known as a magnetic storm. Usually this follows a few hours later than the observed phenomenon, as if time were needed for the influence to travel across the intervening 93,000,000 miles. Simultaneously there is frequently a display of the Aurora. The "northern lights," as they are often called in England, are therefore more frequently seen near the times of maximum sun spots.

Whilst alluding to the Aurora it may be well to observe that the radiating centre appears not in the direction of the pole of the earth, but towards the magnetic pole, which is now some 16.5° west of due north as seen in England. Frequently the great rays of light, which are generally a distinguishing feature of the phenomenon, have a slow motion from west to east.

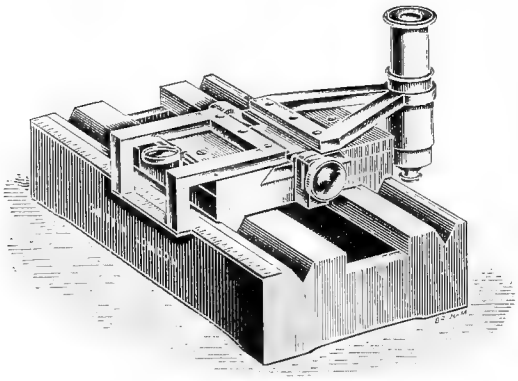
More directly connected with the sun is the wonderful Zodiacal Light. What its real nature is, is little more than conjecture. In appearance it is like a cone of light varying in breadth from 10° to 30° according to Hind, and stretching along the course of the ecliptic for some 70° to 100° from the sun's place. Demonstrably, therefore, it must extend to a distance from the sun beyond that of the planet Venus, if indeed it does not reach outside the orbit of the earth. In appearance it is not unlike the Milky Way. In the tropics it is always visible after sunset and before sunrise, but in England, February, March and April are the best for evening observations, and September and October for morning appearances. So far only once has its light impressed its image on the photographic plate. The spectroscope shows a continuous spectrum, making it probable that its light is in reality reflected sunlight. The plane of the Zodiacal Light does not exactly accord with that of the sun's equator, or with that of the ecliptic, though I approximate very near to that of the former. In shape it is, in my opinion, vertical.

(To be continued.)



CONDUCTED BY JAMES QUICK.

NEW VERNIER MICROSCOPE.—Messrs. John J. Griffin and Sons, Ltd., of Sardinia Street, W.C., have lately introduced some more new pieces of apparatus, which will be certain to supply a desideratum in the various schools and colleges. Among these may be mentioned a useful vernier microscope for measuring lengths, etc. Along the top of a perfectly rigid cast iron base run two parallel, deeply cut grooves in which slides a substantially built brass carriage, supporting a smaller carriage running between parallel guides. Upon the smaller carriage, the reading microscope is fixed. A thick brass strip the entire length of the base, let in flush with the top, is accurately graduated into half millimetres. Readings can easily be obtained to $\frac{1}{200}$ths mm., by means of a vernier which is attached to the carriage holding the microscope. This carriage is moved



backwards or forwards by means of a fine adjustment screw, as shown in the accompanying illustration.

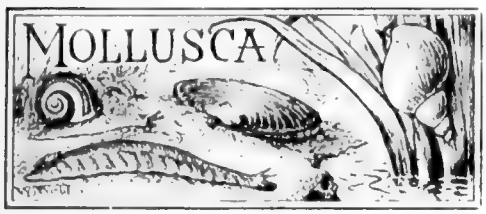
WIRELESS TELEGRAPHY.—Mr. Marconi arrived back in England from America towards the end of last month by the "St. Paul," and when the vessel had approached to within some sixty miles of the Needles, wireless messages were commenced between the two, and were repeated frequently as the vessel approached land. The passengers on board therefore had the unique opportunity of obtaining the current news long before disembarking. The ship's compositor made good use of the occasion by printing, on the spot, a miniature newspaper containing the news received, and then selling the same at one dollar per copy; the receipts being handed over to the Seamen's Fund. It has been reported that the Marconi Wireless Telegraph Company has been incorporated in New York with a capital of ten million dollars, to introduce and work Mr. Marconi's patents in America.

J. F. N. G.—The Editor cannot admit anonymous communications in any part of SCIENCE-GOSSIP. Please send name and address.

TULIPS AND ORCHIDS IN SOUTHERN FRANCE.

About the month of April, springing up in the early corn and under the plum trees, may be seen the first flowering tulips. The yellow *Tulipa sylvestris* comes first, a long, narrow bud opening to a lovely yellow and scented flower. It is a beautiful sight to see them thus in full bloom, all wide and reflecting the sun's rays from their shining petals; just a little protected by their faint green leaves. Thus they seem to gracefully arise among the lightly sprouting corn, a contrast to the curious bare brown twisted stems of the vines. About two weeks later sprung up the great open red cups of the *Tulipa oculus-solis*, shining like blood through the sunlight. These flowers have a black centre, are larger and with more spreading leaves. Mixed with the yellow, in the shade of the branching, lichen-clothed trees, tangled with ivy, wild vine, and clematis, they form as fair a sight as flowers can give us on a fresh spring day. Again, on the hills, in the Cevennes, wild tulips blossom so high and thick as to obstruct the view, and they are crushed under foot by the shepherd or peasant in passing. Earlier than the tulips are the daffodils, and I do not know which are the lovelier. The daffodils run simply wild, all in golden tufts and groups. From a distance, one sees nothing but a clear golden stretch, and the farmer's plough cutting through the land catches their roots, nipping off the beautiful dancing heads. The white narciss in the broad meadows grow in great rising tufts. Jonquils are under the great spreading elms on grassy banks near the roadsides, while the blackthorn and wild plum drop a shower of light petals on the ground, exquisitely white as snow. Little white delicately scented hyacinths also grow on the banks of the river Lol, and above, over the stretching vineyards, the star of Bethlehem opens wide in the sun; the starry blossoms of pure white, striped white and green on the outer side. In tufts of grass are the grape hyacinths, a dull blue, each flower a little globe of honey for the bees. The meadows, marsh land, ditches and open hillside, have a charm of their own in the different orchid flowers. The early purple orchis (*Orchis mascula*) decks the meadows, while the green-winged meadow orchis (*Orchis morio*) is found in the damp limestone meadows. The sweet scented orchis (*Gymnadonia conopsea*) rose-purple, with a quaint long spur, is found on the hilly pastures. Some which I uprooted in bud, were carried home in moss, where they flourished in pots, blooming well. The meadow grasses are nearly all flowers by the end of April. *Orchis pyramidalis*, a lovely rose pink, flowers with the quaking grass and early budding moon daisy. Along the roadsides, where during all winter one has seen its broad freshly shining leaves, blossoms forth *Orchis hircina*, a brownish green flower, and smelling. In the woods, butterfly orchis (*Habenaria bifolia*), a lovely white scented orchis, springs up in the damp mossy glades.

(Miss) Hampson, London.



CONDUCTED BY WILFRED MARK WEBB, F.L.S.

CONTRIBUTIONS TOWARDS A MOLLUSCAN FAUNA OF HEREFORDSHIRE.—A paper on this subject has been written by Messrs. Arthur E. Boycott and Ernest W. W. Bowell, and published by the Woolhope Naturalists' Field Club. It is, however, by no means intended to be merely a local list, and although it fills over a hundred pages, the authors begin with an apology for its "very incomplete state." We have, however, to take it as we find it, and may say at once that Messrs. Boycott and Bowell have succeeded in their endeavour. They have presented to us something new, and, like all novelties, open to much criticism, but an honest attempt to graft on to the old style of collecting some work of a modern kind. After a glance at the paper it would be no longer possible to call the authors only conchologists or malacologists, for they are true students of the mollusca, considering the small series we boast of from almost every point of view. In the paper are given tables of distribution according to fourteen sub-divisions of the county, already made out for the flora, as well as for three geological formations, Old Red Sandstone, Silurian and Limestone. Several pages are devoted to methods in which the anatomical side is dealt with, indeed the authors say that they "found this one of the most interesting branches of the subject." It is worthy of mention that anatomy is not for a moment supposed to be "utilised as a *convenient* way of differentiating species." Microscopical reagents are discussed, and one cannot help quoting the remarks made about mounting shells, as they agree so precisely with the ideas often expressed by the present writer, on curatorial methods. "Any system, however, of keeping shells, that is for the purposes of a private collection, which involves sticking them on to cards, etc., cannot be too strongly condemned. A shell once stuck down is practically removed, till it is unstuck again, from playing a very useful part in the study of biology; it is scarcely more than a subject on which to exercise the visual aesthetic sense." A true remark also is that which says, there is no single one of our species whose habits and anatomy have been at all completely worked out. A novel feature of the paper is the attention given to measurements, whether as to size or to weight. We wonder very much, however, at the "Shell Collectors' Handbook for the Field," by J. W. Williams, being seriously considered in this or any scientific connection. Most praiseworthy is the attempt to tackle nomenclature, and the giving of synonymy in a number of cases, but this is often treated in a conversational way, that leads to very little, and the authors are not consistent. It is a pity that a committee is not formed to settle the question so far as possible, seeing that we have only about a hundred and forty species to determine. Slugs have had little attention paid to them in Herefordshire, nine species only being recorded. Under the heading of various species, many interesting records of colour variations are given, as well as suggestive remarks which well deserve discussion. There are also little points here and there which show that keen observations have been made in the field, as well as at home. In the present short notice many interesting things have to be passed over, but we must call attention to the fact that *Lymnea peregra* and *L. auricularia* are considered as one species, under the name of *L. limosa* L. At last some one has definitely expressed the opinion held by many of us, that these two so-called species are not yet sufficiently differentiated to warrant two names; but evidence is still required upon the point. A single sub-fossil deposit at Ledbury is alluded to, which is interesting, owing to the fact that two species of *Vertigo* not hitherto recorded for the county, occur there.—*Wilfred Mark Webb, 2, The Broadway, Hammersmith, November 16th, 1899.*

SCALARIFORM HELIX ASPERSA.—In SCIENCE GOSSIP (*ante*, p. 181) I saw a figure of the scalariform monstrosity of *Helix aspersa* identical in appearance with a specimen I presented a few years ago to the British Museum. It was found a great many years since by an acquaintance of ours, who used to live at Henbury, in the Arbutus Walk in Blaise Castle Wood, which extends along a portion of the precipitous side of the valley forming the Blaise Castle Gorge. It is the only specimen I have seen from this district.—*Spencer George Perceval, Severn House, Henbury, Bristol.*

[A monstrosity such as the scalariform *Helix aspersa* is not dependent upon locality one would say, but is due to some injury, or other cause which leads to the whorls taking a larger curvature when growth is recommenced. The writer has a specimen of the common snail from Reigate Hill, which he collected long before he took up the systematic study of shells, which though not attaining quite to the remarkable conformation of the shell figured upon p. 181, shows this point very well.—*W.M.W.*]

VERTIGO SUBSTRIATA.—Some time ago I found, but have not hitherto recorded, a number of specimens of *Vertigo substriata* Jeff, at Westerham, in Kent. The molluscs in question were in a similar situation to the one in which I discovered the same species in Essex—among the damp grass, in swampy, but slightly rising ground at the edge of a stream. Though common enough in Pleistocene deposits recent Vertigos are somewhat rare, and one would think that more careful collecting would yield more records.

THE HOMING OF LIMAX FLAVUS.—Mr. Taylor's remarks upon the homing of slugs and snails in the last part of his monograph, notice of which will be found on page 242, remind me of the behaviour of a specimen of the large yellow lilac-horned slug *Limax flavus*. It was when I was living in this neighbourhood before, that the characteristic "spoor" of a large slug was noticed leading from the grating over a drain up the wall to a soap-dish hung on a nail and back again. I do not remember now whether the trail crossed itself; but night after night a new one was made and the cake of soap diminished, until at last, having indulged a little too freely, the slug was somewhat late in returning home, and was captured before reaching its hiding place. Upon dissection the alimentary canal of the animal was found to be full of "primrose" soap, and its characteristic internal shell went to enrich my collection. The food chosen in this case also serves to show the omnivorous tendencies of the Limacidae, for which the varied forms of teeth described by Mr. Taylor in his monograph well fit the members of this family.—*Wilfred Mark Webb, 2, The Broadway, Hammersmith, W.*

THE death of Sir Richard Thorne Thorne, the principal medical officer of the Local Government Board, removes one of the enthusiasts in the crusade against consumption, and a man who has done a very great deal for sanitary science.

AT the last meeting of the Essex Field Club, held at Jermyn Street Museum, a woodlouse, new in the fauna of the British Isles, was exhibited. Its name is *Poxellio ratzburgi* Brandt, and it was found at Warley by Mr. Wilfred Webb, who is working out the land Isopoda of the county of Essex.

MESSRS. LONGMANS have in the press an English edition of "Malaria, according to the New Researches," by Professor ANGELO CELLI, Director of the Institute of Hygiene, University of Rome. It is translated by JOHN JOSEPH EYRE, M.R.C.P., L.R.C.S.Ire. Ph.D. Cambridge. With corrections and additions made for this translation by the Author.

PROFESSOR E. A. SCHAFER has received from the University of Edinburgh grants from the Moray Fund, towards the expenses of his researches on the cerebral nervous system. Dr. John Malcolm has received funds from the same source for experiments on the alterations in bone marrow produced by nucleins and their allies.

THE famous herd of Chillingham wild white cattle are given a new owner by the death of Lord Tankerville, at the advanced age of ninety. We might point out that too careful preservation of a strain may cause it to deteriorate, while the occasional gift or exchange of an individual cow or bull might be of advantage to two herds.

WE regret to record the death, at the age of 68, of Mr. R. James Gregory, the well-known dealer in geological specimens, which took place on December 15th. Our readers will doubtless recall that the recent articles upon "Meteorites" in our pages were founded upon the very fine collection of these bodies, one of the best in existence, in the possession of the late Mr. Gregory.

WHEN the Boer War broke out there were on the way to Pretoria, for the South African Republic, several insect cabinets consigned to the order of that Government, by Messrs. Janson and Sons, of Great Russell Street, London. What has become of these valuable cabinets since they left Cape Town cannot be discovered, as they were in transit up country when war was declared. Their value much exceeds £100.

ALL those who are fond of pictures of animals should manage to get a ticket for the "One Man Show" by Mr. Henry Stevens, at the Camera Club. It will be open all through January. We have seen many beautiful photographs of living animals at the Zoo by professional photographers, and of creatures in their haunts by field naturalists who have made this kind of work their special study, but in none is the perfection of detail to be seen which characterises Mr. Stevens' charming creations.

AMONG the Lecture Arrangements at the Royal Institution before Easter are, Mr. C. Vernon Boys, Six Christmas Lectures, specially adapted for young people, on Fluids in Motion and at Rest; Professor E. Ray Lankester, Twelve Lectures on the Structure and Classification of Fishes; Dr. W. H. R. Rivers, Three Lectures on The Senses of Primitive Man; Professor H. H. Turner, Three Lectures on Modern Astronomy; and The Right Hon. Lord Rayleigh, Six Lectures on Polarised Light. The Friday Evening Meetings will begin on January 19th, when a Discourse will be given by the Right Hon. Lord Rayleigh, on Flight.

BY the death of Sir Henry Tate, Bart., science and general education, as well as art, lose a liberal patron. Born the son of the Rev. W. Tate, at Chorley, in Lancashire, in 1819, he died at his house on Streatham Common, in his 81st year. His magnificent gifts to the nation included the recently-erected Tate Art Galleries for the reception of modern masterpieces, £50,000 to University College, Liverpool, £10,000 to Owen's College, Manchester, numerous educational scholarships, several public libraries, and £30,000 for an homoeopathic hospital.

EARLY in the New Year, Mr. John C. Nimmo will publish the first volume, by Professor Sayce, of Oxford, of "The Semitic Series." This is a set of new standard handbooks intended to present compactly, and in popular scientific form, the more important facts in the history, religion, government, language, and customs, of the Babylonians, Assyrians, and allied Semitic races of ancient history. The first issue is: "Babylonians and Assyrians' Life and Customs, with special reference to the Contract Tablets and Letters," by the Rev. A. H. Sayce, Professor of Assyriology at Oxford. Other volumes will follow at regular intervals.

ONE of the saddest events in connection with the siege of Ladysmith was the death of Arthur C. Stark, M.B., who was killed at his own door by an enemy's shell bursting at his feet. He lived only a few moments, exclaiming "look after my cat." This has been treated as one of the humours of the war; but as explained by one of his relatives, the last word could only have been the first part of the word catalogue, and that he died before completing his sentence. Dr. Stark was engaged when the war broke out, in obtaining material for a book on the birds of South Africa. This was to have been the first of a series on the fauna south of the Zambesi, edited by Mr. Sclater, the Director of the Cape Town Museum.

IT is with very greatest regret that we have to record that our contemporary "Natural Science" has had to own itself eliminated in the struggle for existence. It was originated in 1892 by some of the staff of the British Natural History Museum. The magazine soon became important on account of its straightforward and trenchant criticism as well as by reason of the valuable matter that specialists contributed to its columns. Only the Natural History Sciences were considered. If there is one branch one could pick out as having been typical of "Natural Science" it would be that philosophic biology which Darwin's work has pre-eminently helped to evolve from the older Natural History.

WE recently received from the Warwick Trading Company, Ltd., of Warwick Court, High Holborn, an extensive and classified catalogue of new Cinematograph Films covering a variety of interesting subjects in motion. As we went to press a supplementary list to the foregoing reached us, chiefly devoted to subjects connected with the war in the Transvaal, though there are more general subjects included.

WE regret to report that Mr. Carrington, our editor, was taken very seriously ill a few days before Christmas. We are, however, glad to be able to add that, at the time of going to press, his condition has changed for the better, and we sincerely hope the improvement will be maintained.

THE WINDSOR AND ETON SCIENTIFIC SOCIETY arranged an exhibition this year on December 6th and 7th, which was well worth the journey from London to view. The President, Mr. M. D. Hill, B.A., F.Z.E., of Eton College, had a large series of living marine animals from the Channel, the specimens of *Echinus* particularly well showing their tube feet. He had also a large exotic legless lizard allied to the blind worm, and a blue tongued lizard, which from time to time he warmed at the radiator in the series of electrical novelties. A feature of the show was the demonstration of stereoscopic lantern pictures by Mr. Oldham. The two familiar parts of the double photograph had been painted as separate lantern slides and were thrown one over the other upon the screen. One lantern using red light gave a red picture, the other produced one with complendary colour, green. Where these pictures overlapped, which they did not of course absolutely do, the resulting picture was a monotone. There was also to the naked eye a necessary indistinctness, seeing that the combined pictures were not identical. On putting on, not rose coloured spectacles exactly, but a pair with one glass red and the other green, a fine effect was produced, each glass allowed only one picture to reach the eye, which the pair combined to form a single photograph, but in relief as seen in the ordinary apparatus. Mr. Everett attracted quite as much attention with Zesla's experiments, and the most recent developments of his apparatus. The explanation of the matter is, that alternately electrical currents of very high frequency, have no harmful effect on the human frame. It must, however, be said that to see a vacuum tube lit up when taken in one hand by the experimenter whose other was in connection with the terminal of the apparatus—seemed a veritable representation of a magic wand. The effect was not lessened when sparks were drawn from Mr. Everett's nose. A Maxim gun with two-red-coated "beggars present in the body" to explain its mechanism, came in for a good deal of attention. Carbon printing from photographic negatives was practically shown. Liquid carbon dioxide was still a novelty to many present. Microscopes were numerous, and a fine series of lepidoptera gave a touch of colour. Lastly, the presence of the honorary secretary, Mr. J. W. Gooch, lent success to his own work.—*W. M. Webb.*

NORTH LONDON NATURAL HISTORY SOCIETY. *Oct. 5, 1899.*—The exhibits of the Pocket Box Microscope and Lantern Exhibition were considerably more numerous than at the previous Exhibition, and contained much of interest. Messrs. Austin and Hanson exhibited birds' eggs, Messrs. C. S. Nicholson and R. W. Robbins botanical specimens, Mr. Nicholson's including *Inula crithmoides*, *Thalictrum dunense*, *Scilla verna*, *Euphorbia portlandica* and *Orobanche hederae*; but the exhibits of Lepidoptera were the most numerous. Perhaps the most interesting of these, in view of the Society's particular studies and aims, was Mr. Colin Murray's box of insects, taken at electric light at Stratford this season; these included *Zeuzera pyrina*, *Dicranura bifida*, *Notodonta dictaea*, *Hylophila bicolorana*, *Leucania obsoleta*, *L. phragmitidis*, *Calamia lutosa*, *Triphaena fimbria*, *Cirrhoedia xerampelina* and *Hecatera serena*. *Oct. 19, 1899.*—Donations: bred series of *Gortyna ochracea* and *Hydroecia micacea* from Stratford were presented to the local collection by Mr. Murray; a bred specimen of *Eupithecia subfulvata* and a few captured specimens of *Hypsipetes autumnalis* (*trifasciata*) from Hale End by Mr. Prout. Exhibits: Mr. Shepherd exhibited various Lepidoptera, including *Hypenodes albistrigulis* from Loughton, *Pandis piniperda* (bred), *Lithosia sericea* and *Cymatophora duplaris* (the dark form) from Warrington. He stated that only one specimen out of nine bred *P. piniperda* had developed perfectly, the rest showing a certain amount of crippling on malformation, particularly in the left hind wing. A discussion ensued as to the probable phylogenetic origin of such weaknesses. Mr. Shepherd also passed round a drawing of a pupa, evidently of *Sphinx convolvuli*, from a larva found on *Convolvulus arvensis* at Deal. Mr. Frost read a paper entitled "Notes and Echoes," urging the society to make certain important departures in its procedure, with a view to organising its work and increasing its membership, and thereby its sphere of usefulness. He emphasised the need for popularising the study, and expressed the opinion that it was essential to the well-being and the development of the society that it should obtain sufficient members to render possible the acquisition of premises of its own. He also put in a plea for the accumulation of facts, as contrasted with mere opinions or theories, and for more systematic research work, and indexing of work already published, in such a way as to make it accessible. In the discussion which followed, Mr. Prout stated that the Council had already appointed a Commission to consider some of these questions, and that they would probably come before the society again by-and-by. *Nov. 2, 1899.*—Exhibits: Messrs. Bacot and Simes exhibited Scotch Lepidoptera taken by themselves this season, including fine variable series of *Hydroecia nictitans* var. *lucens* and of *Cidaria immanata*, and also series of *Erebia aethiops*, *Celaena haworthii*, *Noctua castanea* and others, and odd specimens of *Mamestra furva*, *Noctua dahlii*, *Calocampa solidaginis*, *Cirrhoedia xerampelina*, etc. Miss Robinson exhibited a very interesting lot of paintings of Scottish scenery. Communications: Mr. Bacot announced that he had recently had larvae of the Processionary Moth hatch from the egg, and that they immediately commenced their peculiar processionary performance. Messrs. C. Nicholson and R. W. Robbins reported recent visits to Epping Forest, in which *Chesias spartiata* had been taken in different parts; Mr. Lane stated that this species could be readily tramped up out of broom by day. Election of President: Mr. J. A. Simes, being the only nominee for the office for the year 1900, was declared duly elected president. Mr. Simes then read a very interesting paper on "A Holiday in the Highlands," with numerous lantern illustrations under the superintendence of Mr. Wheeler.—*Louis B. Prout, Hon Sec.*

ROYAL METEOROLOGICAL SOCIETY.—The monthly meeting of this society was held on Wednesday evening, the 20th instant, at the Institution of Civil Engineers, Mr. F. C. Bayard, LL.M., President, in the chair. Mr. Baldwin Latham, M.Inst.C.E., read a paper on "The Climatic Conditions Necessary for the Propagation and Spread of Plague." The bubonic plague is primarily due to a specific organism or

microbe of infinitesimal size—so small that probably 250 millions of them would be required to cover a square inch of surface. Plague is infectious and contagious, and is greatly influenced by pestilential emanations from polluted and waterlogged soils. The author gives accounts of various outbreaks of plague in this and other countries, including the great plague of London in 1665, when 7,165 deaths were recorded in one week in September. Plague is undoubtedly a disease of the poor, and attacks most readily those living on a low diet. The conditions which are conducive to the spread of plague are identical with those which give rise to the escape of malaria from the ground. That the ground itself exercises an enormous influence upon plague is shown by the fact that in all the epidemics, persons living on the ground floors suffer to a much greater extent than those who live in the higher storeys of the houses. Mr. Latham says that there cannot be a doubt that the conditions which ordinarily produce evaporation from water or land surfaces are identical with those which produce exhalations from the ground; and these exhalations consist largely of vapour of water carrying matters injurious to health with them. Mr. Latham has discussed the meteorological observations (including the temperature of the soil at the depth of 9, 20, 60 and 132 inches) made at the Colaba Observatory, Bombay, and has compared them with the number of deaths from plague during the recent epidemics in Bombay. He says that if the temperature of the air increases beyond the temperature of the ground so that its dew-point is above the temperature of the ground, condensation takes place instead of evaporation. To this increased high temperature may be due the sudden stoppage of plague after a certain high temperature has been reached; which by raising the temperature of the dew-point, stops all exhalation from the ground and may cause condensation to take place instead of evaporation. So also a sudden fall of temperature causes plague to arise; for a fall of temperature means that the temperature of the dew-point must fall and the tensional difference between a low dew-point and a high ground temperature would at once lead to exhalations escaping in large quantities from the ground, and so lead to the liberation of the plague bacillus from the ground, accompanied with the exhalations necessary for its development.

NOTICES OF SOCIETIES.

*Ordinary meetings are marked †, excursions *; names of persons following excursions are of Conductors. ⅊ Lantern Illustrations.*

LIMERICK FIELD CLUB.

Jan. 2.—*†⅊"Plates and Printing Papers."
,, 9.—†Seventh Annual General Meeting of the Club.
,, 23.—†⅊"Irish Geological Notes." J. P. Dalton, M.A., M.R.S.A.I.
Feb. 6.—*†⅊"Portraiture."
,, 20.—†⅊"Early Christian Architecture." P. J. Lynch, F.R.S.A.I.
March 6.—*†⅊"Outdoor Photography."
,, 13, 14, 20, 21, 27, 28.—Lectures by G. H. Carpenter, B.A.
April 3.—†⅊Exhibition of Prize Lantern Slides, lent by *The Amateur Photographer*.

Francis Neale, Hon. Sec., Limerick.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

Jan. 11.—⅊†Photomicrographic Illustrations. Fred. Noad Clark.
,, 25.—Annual Meeting, 7 p.m.

Stanley Edwards, Hon. Sec., Hibernia Chambers, S.E.

HULL SCIENTIFIC AND FIELD NATURALISTS' CLUB.

Jan. 3.—†Natural History Notes in North Wales. R. H. Philip.
,, 17.—⅊†Symbiosis. J. F. Robinson.
,, 31.—⅊†Cyclone and Cloud. C. H. Gore, M.A.

T. Sheppard, Hon. Sec., 78, Sherburn Street.

SELBORNE SOCIETY, FIELD CLUB.

Jan. 13.—Bird Section, Natural History Museum, Cromwell Road. Bowdler Sharp.
Feb. .—Archaeological Meeting.
Mch. .—Kew Gardens. Bulbous Plants and Museums. Professor Boulger.

HAMPSTEAD ASTRONOMICAL AND SCIENTIFIC SOCIETY.

Jan. 12.—†Notes on Some Odd Fish. E. R. Budden, F.I.C., F.C.S., F.L.S., F.Z.S.
Feb. 2.—†The Mechanics of the Bicycle and of Bicycle Riding. C. O. Bartrum, B.Sc.

Basil W. Martin, 7, Holly Place, Hampstead, N.W.

TUNBRIDGE WELLS NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

Jan. 12.—⅊The Natural History of Malarial Fever. By A. W. Brown, B.A., F.L.S.
,, 19.—⅊Haunts and Habits of British Wild Birds. By R. Kearton, F.Z.S.
Feb. 2.—⅊Microscopical Meeting. Paper on Mycetozoa. By Mr. R. R. Hutchinson.
,, 8.—Phenomena outside our Apprehension. By Mr. W. Brackett, at 94, London, Southborough.

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